THE AEROPLANE and ASTRONAUTICS

OCTOBER 21, 1960

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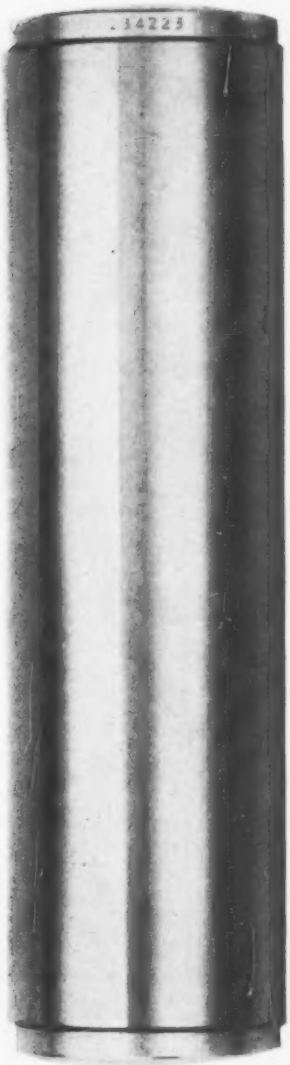

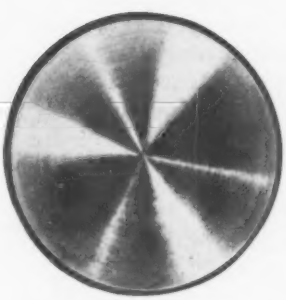

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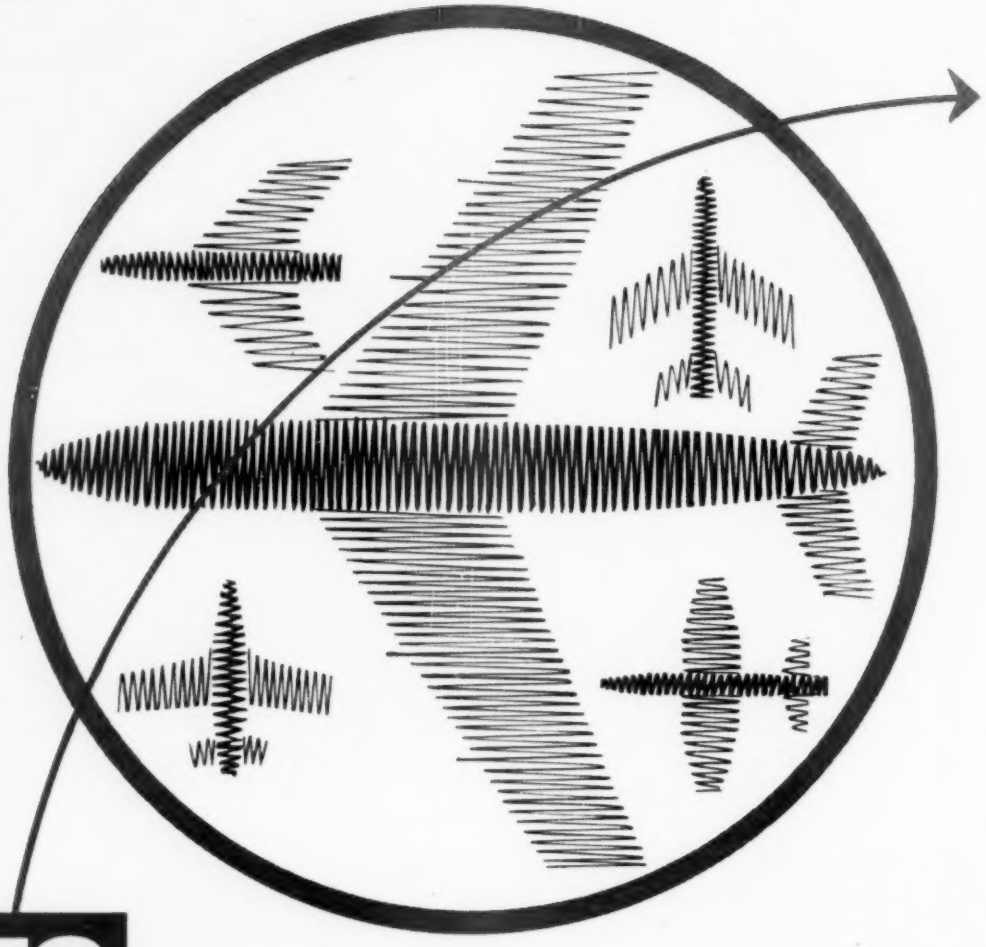

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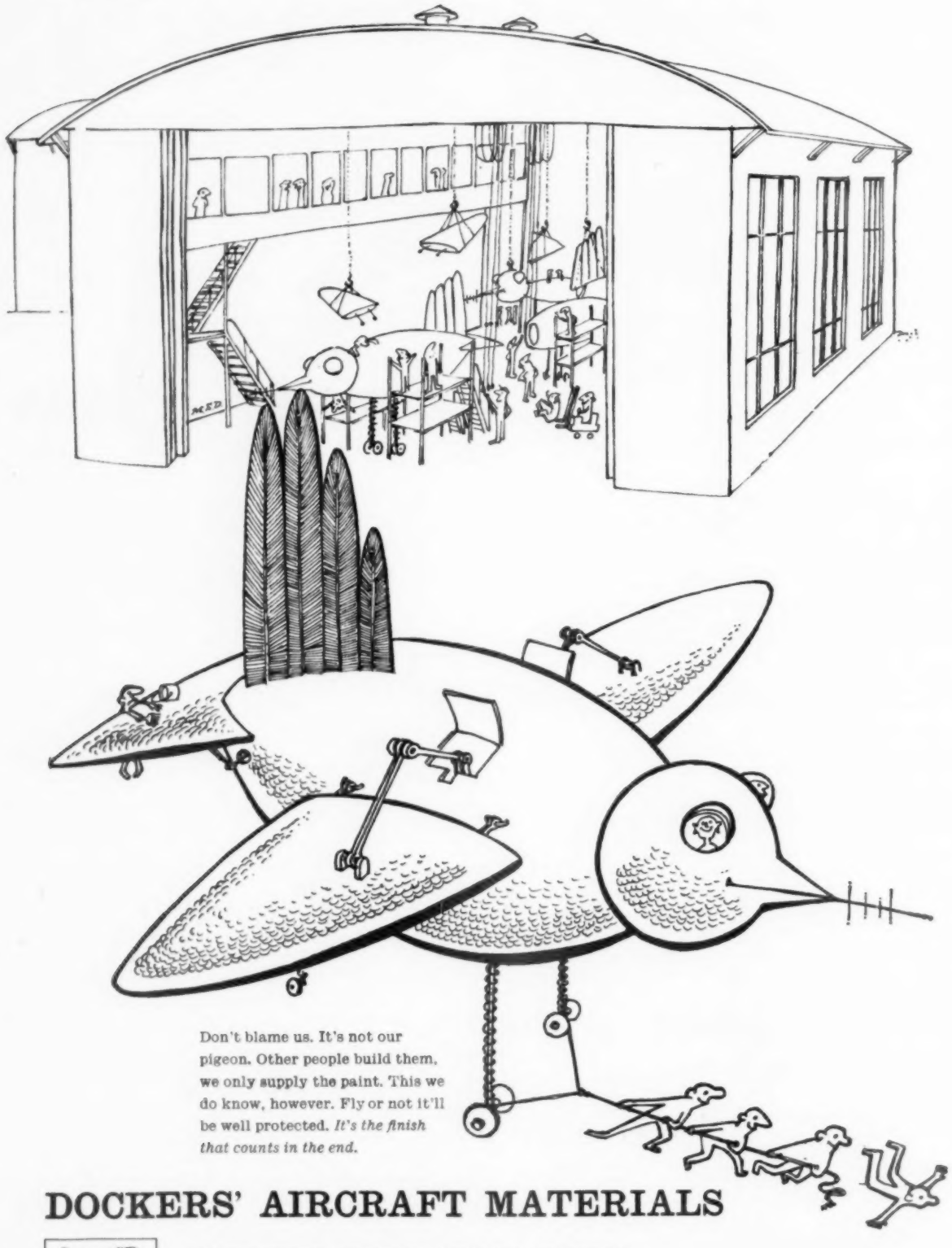

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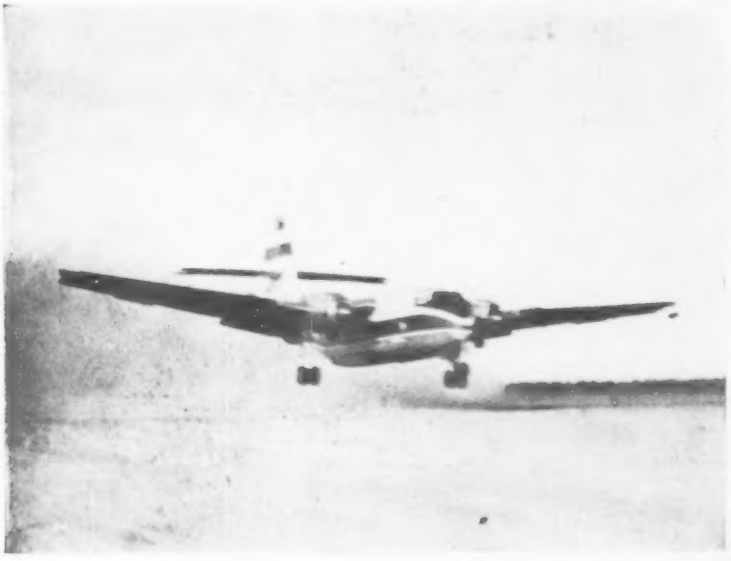

At Mansour and Bahrein Island in the Persian Gulf, the Caribou is seen — in the photo at left centre — taking off from unadulterated desert sand. Photo, lower right, shows depth of furrows ploughed in sand by aircraft's nose-wheel gear.

A supreme test of STOL ability was staged at Fort Rucker, Alabama, on a mud strip soaked with water for hours, then ploughed to a depth of 14". Photo, upper right, shows mud compacted ahead of wheels. Right centre, deep ruts etched in mud by Caribou take-offs and landings.

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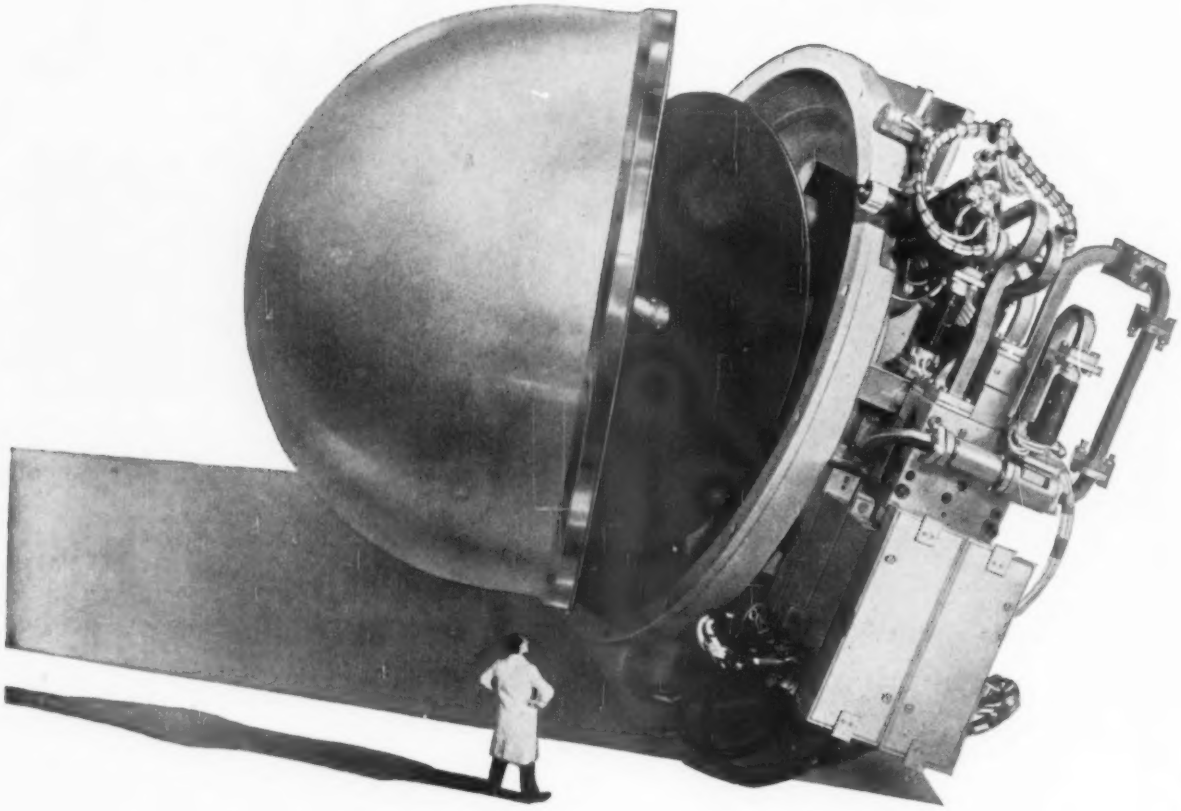

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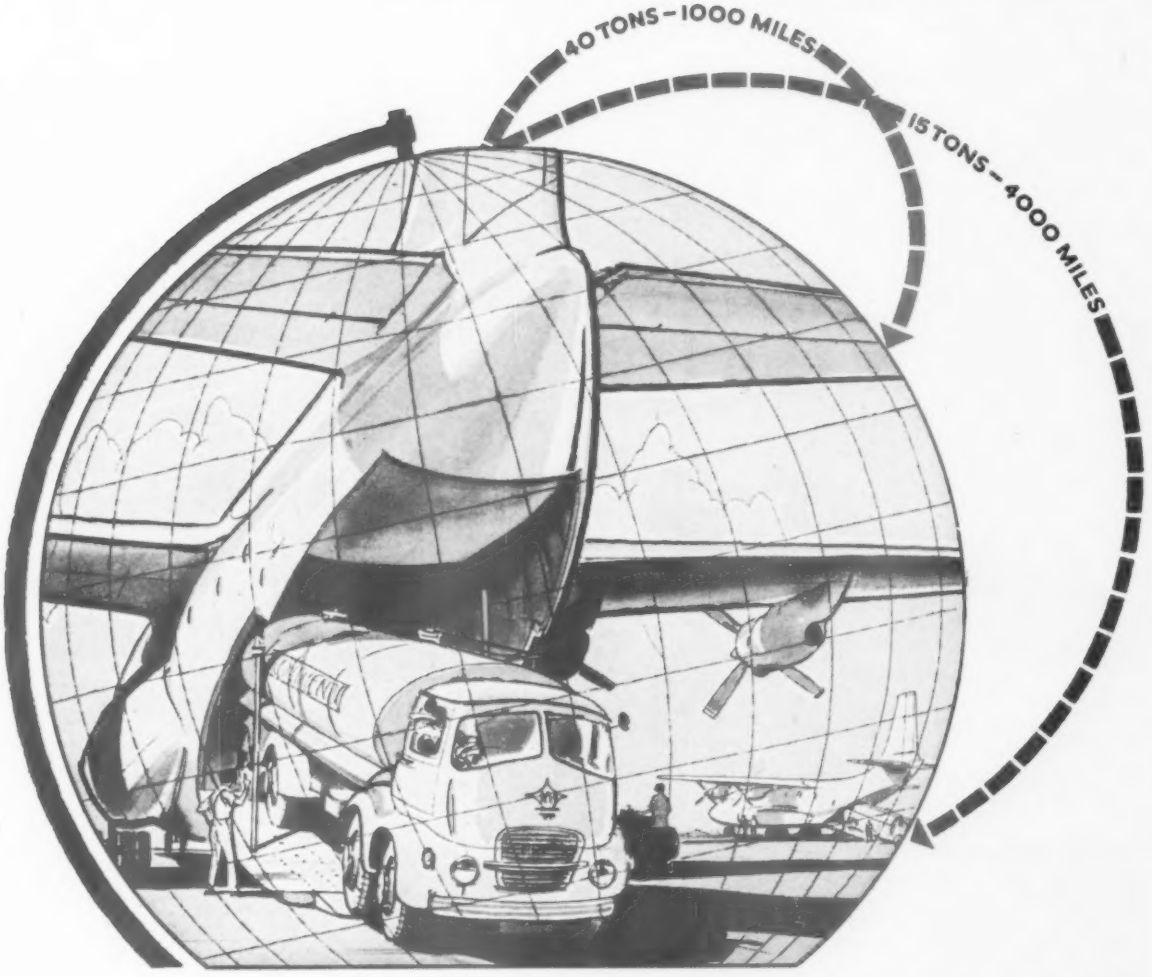

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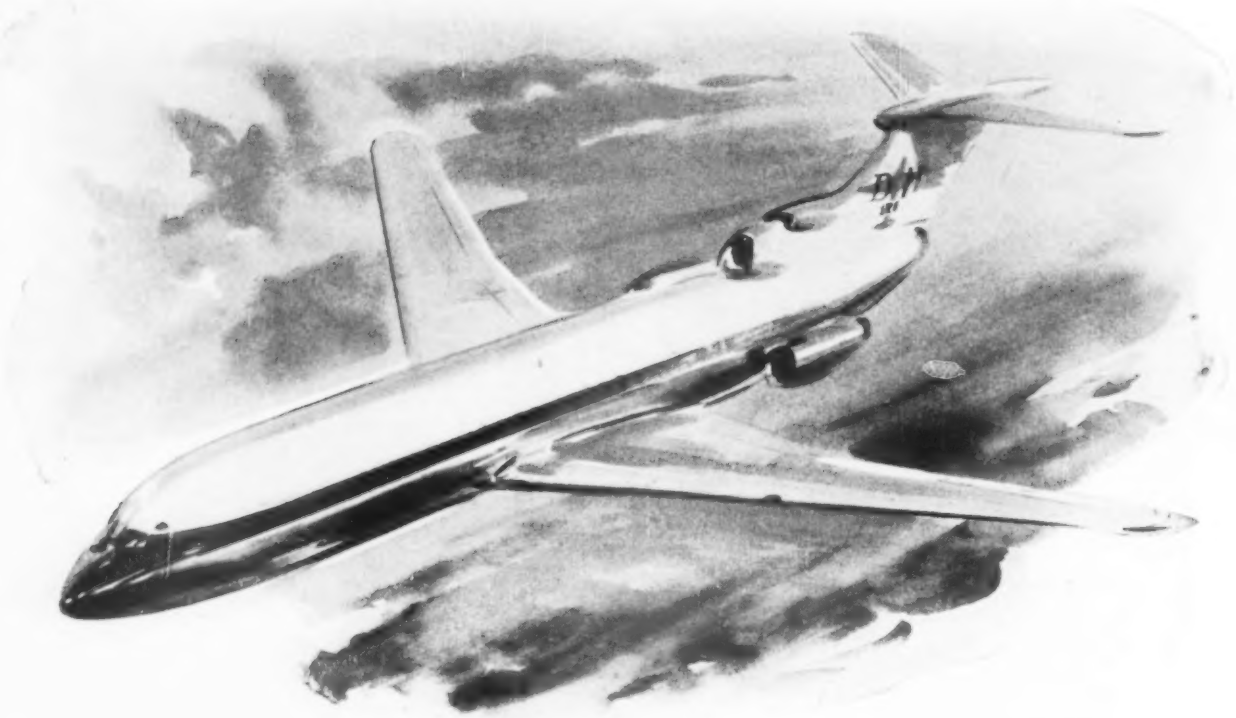

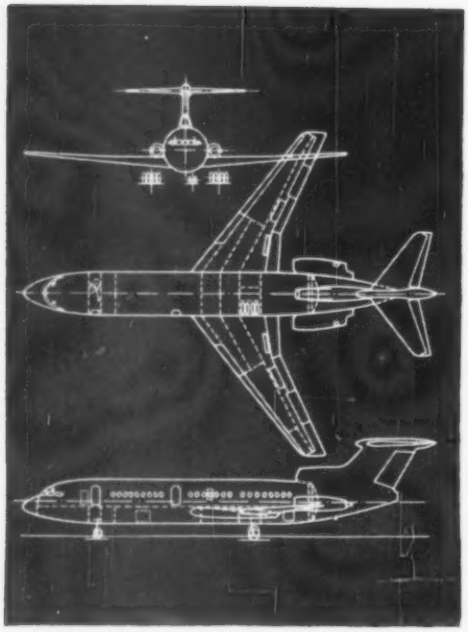

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THE AEROPLANE and ASTRONAUTICS

VOLUME 99 NUMBER 2557 OCTOBER 21, 1960

Revive the Airfields

How dusty seems today that most overworked word "airmindedness." The global air is split asunder by the thundering of rockets, pushed into sonic waves by roaring manmade aircraft; it is vibrant over any great city with the scream of turbines driving the airliners of scores of airlines about their lawful business and even over the lovely contoured English southern downland the sailplanes slip and lazily turn about their pilots' purposeful pleasures.

Airmindedness was a word coined in the days before the country had really begun to pour its treasure in gold and blood into keeping the British skies inviolate. And thanks to the airmindedness engendered in that epoch the Battle was won.

Today many people of these islands are heartily sick of the air. And in our view, brushing the dust off airmindedness is not going to make them change their minds. They are, of course, glad to travel by air to exotic places for holidays.

In such circumstances questions may well be asked: "What about the Air League? If this imposing body does not exist to sell the idea of airmindedness, what is its function?"

To answer that one is simple. Let us take a look at the Air League's Report on General Aviation. This somewhat unfamiliar term has been adopted to provide a portmanteau phrase to cover business and executive flying, crop-spraying by air, aerial photography and those two very old friends, pleasure and sporting flying.

It is all these aspects of civil aviation which the Air League wishes particularly to further now. To do this it has called for Government action under a number of heads and also by the aviation fraternity itself. These recommendations will be found duly set out on page 551.

We think them all admirable.

As that most unjustly denigrated of our writers, Rudyard Kipling wrote: "Transportation is civilization." Today the swiftness of written and spoken communication is so rapid that only by following messages up with personal visits to bring about decisive action can advantage be gained in a highly competitive world.

In this country more and more factories are being built to take work to where the workers are. This means that already overburdened executives have to cram in more visits. Railway travel in these islands has long been a scandal and conditions continue to worsen. Motor-car travel is choking itself to death.

Only in the air is there yet room for the executive with his party of managerial experts to move quickly and on schedule from factory to factory. Only by air travel can the highly specialized technical representative make his contacts quickly enough to defeat his rival.

To bring this about there must be airfields for business aviation. Croydon must be brought to life. Hendon is needed too.

Thus more airfields would help the export drive. How timely is the Air League's campaign to expand General Aviation!

The League must deploy all its forces into battle. It cannot rest content with the appointment of a high-ranking civil servant to look after General Aviation affairs in the Ministry. The League must do all it can to help the Royal Aero Club's fight to revive Croydon. A victory for business flying on that green field would rank with those of history.

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Matters of Moment

Why Harry our Visitors?

OPPOSITION continues against the long-distance-passenger arrival and departure forms which are due to come into use on Jan. 1, 1961, if the Board of Trade order is not annulled by Parliament. We hope Members will investigate.

At a time when IATA and ICAO are beginning to get somewhere in the efforts by the "facilitation" committee to reduce the amount of form-filling, this new questionnaire is particularly irritating to the airlines. The main difficulties lie in the distribution and collection of the forms—particularly in the case of departing passengers—and in the harassment of busy passengers. B.O.A.C. has suggested that the departure procedures should be the responsibility of the immigration authorities.

The information is intended for some mysterious statistical purposes in assessing data about long distance travellers to and from the U.K.; similar forms are already in use for oceanic travellers, who will have simplified forms from Nov. 1 this year. Ten questions have to be answered by departing passengers and 11 by incoming passengers. They cover the usual personal information, the reason for the visit, the length of stay, occupation and so forth.

Fighting for Croydon

AS chairman of the aviation committee of the Royal Aero Club, Mr. Peter Masefield plead last week for the re-opening of Croydon Airport as an executive and business aircraft base providing an unanswerable argument, from the aviation viewpoint, for the retention of a key airfield in close proximity to London. Whether the views of the Royal Aero Club will be allowed to prevail, however, is still uncertain, having regard to the many other organizations with grandiose ideas for its non-aviation development in this land-hungry country of ours.

During his address to the public inquiry at Wallington, Mr. Masefield pointed out that the R.Ae.C. were not concerned to maintain the use of the aerodrome for scheduled air transport or for club instructional purposes. They were concerned that sufficient area, terminal buildings and hangars should be preserved for the vastly expanding business and executive flying. The whole of the present airfield area was not required and there would be sufficient room available within the present airport boundaries for adequate grass runways and playing fields, a shopping centre and industrial development.

Plans for this have already been prepared and presented. The solution to the problem of combining an airfield with busy domestic area should be interesting, particularly when one recalls the congested approaches to Croydon before its closure. But the R.Ae.C. is presumably resigned to losing some of the land, whatever the result of the inquiry, so its approach is necessarily realistic.

ALVIS OCCASION.—A recent visitor to Alvis Ltd. at Coventry was General Norstad here seen with Mr. J. J. Parkes, chairman and managing director of the company.

After tracing the growth of business aviation in the U.S. and this country, and discussing the awakening interest of the British industry in light aircraft, with which he is intimately concerned, Mr. Masefield compared the airfield position of London with those of such cities as New York and Paris. London was the worst served of all, with no active airfield within 15 miles of the city centre.

Since the War, 22 former airfields in the London and Home Counties have been closed to general aviation, and such formerly famous names as Hendon, Heston, Hanworth, Brooklands, Northolt, Heathrow, Broxbourne, Kenley and Croydon were quoted. Mr. Masefield also included Abridge, but this is surely actively available for light aircraft as Stapleford Tawney?

Croydon satisfied every requirement as London's business airfield. These included rapid access by public and private transport; convenient location by air from the Continent; simple A.T.C. procedures; adequate terminal and hangar facilities (which, as Mr. Masefield pointed out, would cost vast sums to reproduce elsewhere); restaurant and hotel facilities; customs amenities; and no objections from the M. of A. for such a purpose.

Mr. Masefield concluded by saying that there were concerns ready and willing to come forward with the necessary funds

AIRPORT OPENING.—Lord Brabazon of Tara addresses the guests at the opening of Coventry Airport's new concrete run-away. Sitting to his right is Alderman Mrs. Pearl M. Hyde, chairman of the Aerodrome Committe, with the Lord Mayor, Alderman H. Stanley, to his left. The Armstrong Whitworth Argosy in the background later made the first official take-off from the runway, carrying a party of civic dignitaries.

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Photograph copyright "The Aeroplane and Astronautics"

TANDEM WEIGHT LIFTERS.—On Oct. 13 three pre-production Westland Belvedere H.C.1s were handed over to the R.A.F. at Weston-super-Mare. More about these helicopters, which are being operated by a Belvedere Trials Unit at Odiham, will be found on page 564.

to buy and to operate Croydon as a licensed business aerodrome.

A representative of McAlpine Aviation, one of the leading executive operators, said that his company were prepared to purchase and operate the airfield. Of its present 400 acres, some 296 would be required for flying, the remaining 134 being available for redevelopment.

Sir Derek Walker-Smith, Q.C., M.P., was retained by the Royal Aero Club on its behalf during the inquiry, which was also addressed by Lord Brabazon and Wg. Cdr. Vigors. The latter, as chairman of the Business Aviation Advisory Committee, listed numerous firms which operated executive aircraft, but said that at least six major companies had decided against employing aeroplanes because of the lack of a London terminal.

Result of the inquiry is expected in about a month's time.

Coventry's Concrete Runway

COMPLETION of the first stage in the development of Baginton as a civil airport for Coventry was marked on Oct. 15 when Lord Brabazon of Tara formally opened the 5,300-ft. main runway. The runway is 150 ft. wide with 75 ft. shoulders, and with 700 ft. and 600 ft. stopways. Congratulating the City's airport committee on its "imaginative, prophetic and wise" decision to put down a runway at the airport, Lord Brabazon stressed the growing importance of executive flying in this country and suggested that Baginton would handle a large amount of such traffic, in addition to scheduled and charter airline flying.

The main east-west runway is expected to be usable 98% of the time, but a secondary 4,300-ft. runway is to be provided as the second phase of the development scheme. The third phase covers construction of a new terminal building to replace the present passenger/Customs hall; additional hangars and aprons; a new approach road; and a car park. Phase four covers the eventual extension of the main runway to 9,000 ft. if required. Three hangars, each 130 ft. by 240 ft., have already been erected.

Main contractors for the new runway were G. Percy Trentham, Ltd., with the City's own Engineer and Surveyor's office responsible for the planning and for the installation of the G.E.C. lighting. The latter includes high- and low-intensity edge lighting, threshold lighting, high-intensity approach lights at one end and low-intensity approach lights at the other end. The runway was designed to have a minimum L.C.N. of 45, but plate bearing tests so far suggest that an L.C.N. of over 70 has in fact been achieved.

Danish Air Force Ten Years Old

ALTHOUGH Danish military aviation dates back to about 1912 it was not until Oct. 1, 1950, that Denmark got a separate Air Force. This had to be prepared and built up almost from scratch after the War, and is today a small, but efficient part of NATO. The ten years' anniversary was celebrated by a parade recently at which King Frederik presented the air stations with their first standards, and by squadron fly-pasts over most Danish towns.

On the occasion of the anniversary the present chief of the R.D.A.F. stressed the importance of the help and advice received by allied countries and Air Forces, not least the part played by Air Chief Marshal Sir Hugh W. L. Saunders who was a special adviser to the R.D.A.F. from 1954 until 1956.

The late Lt. Gen. C. Førslev was the first commander of the Royal Danish Air Force. He was succeeded in 1956 by Lt. Gen. T. Andersen, who since 1959 has been commander of the NATO North Regional Air Forces in Norway. Since then Lt. Gen. K. Ramberg has been the commander.

The R.D.A.F. started in 1950 with 180 aeroplanes, of which 24 were jet fighters (Gloster Meteors). Today there are 286 aeroplanes of which 201 are jet types. The present eight first line squadrons are now being reduced to seven, comprising the following types: F-100D Super Sabre, Hunter Mk. 51, F-84G Thunderjet, F-84F Thunderflash and F-86D Sabre. The last-mentioned are now being prepared for Sidewinder missiles and should be operative with these before the end of this year.

Other types used are Meteor TT Mk. 20, Catalina, C-54, C-47, Pembroke, Sikorsky S-55, Chipmunk, Hunter T Mk. 53, F-100F, Meteor Mk. 7, T-33 and KZ VII.

It is worth noticing that the elementary flying school still has the same number of Chipmunks as it received about ten years ago, not one having been written off. Apart from the elementary training the rest of the training takes place in Canada.

The casualty rate has been 1.4 per 10,000 flying hours during these ten years, but has during the past three years been 1.2, 0.7 and 0.8 respectively. The transport squadrons which are also operating in Greenland have flown 30,000 hours during the ten years without hurting anybody.—P.W.

Ground Support for Skybolt

LAST week Mr. J. Shirey, sales manager for Bendix Support Equipment, of Teterboro, New Jersey, described the check-out sequence programming set which had been adopted by the U.S.A.F. for ground support of the Skybolt air-launched ballistic missile. Use of this equipment by the R.A.F. is under discussion.

The basic equipment being produced by Bendix has the military designation AN/GJQ-9. It is designed as a flexible programming device for the automatic control of any desired sub-system test programme for weapons systems or, for that matter, commercial systems. Its Bendix designation is PC-300; it is basically a solid-state computer which receives instructions from a tape input and works through adaptors to control test programmes. It is a new development stemming from the Bendix equipment used for automatic check-out of Hustler bomber flight-control and air-data systems.

For U.S. Skybolts the AN/GJQ-9 will be used to check-out automatically the complete missile and its ten sub-systems. The navigation and bombing systems in the B-52, which are part of the overall Skybolt weapons system, will still be checked out by existing equipment. But the R.A.F. will probably be getting Skybolts later than the U.S.A.F. and it has been suggested that this Bendix equipment could be adapted for automatic check-out of Vulcan systems as well as those of the missile.

In the U.S., orders have been received for 24 of the AN/GJQ-9 sets, mostly for Skybolt. The cost of each set, without the adaptors necessary to marry it to a particular system, is between £32,000 and £35,000. The prototype set is now being evaluated, the second is undergoing a life test and the third, which is the

COMPOUND HELICOPTER.—This model of the Westland (Bristol) 194 civil transport helicopter shows to advantage the position of its fixed wing located midway between the rotor centres to avoid the downwash. Details were given at the A.O.A. Conference last week (see page 558).

first production model for the U.S.A.F., will be delivered in January. Self-check features are incorporated in the equipment, which is required to have a life of at least 300 hours before it fails; during this time it must remain in calibration.

In Britain the equipment will probably be produced by Bendix Ericsson U.K., Ltd., and there will be collaboration on technical aspects with Elliotts.

A wide range of other applications is expected for the PC-300. One may be its use for flight-line check-out of all the electronic equipment in European-built Starfighters. A scheme has been suggested for a mobile installation of this equipment, which could check all the military electronics of a Starfighter in a matter of 10 min.

Exports Boom in Mexico

GOOD NEWS from Mexico City is that the upward trend in British aero imports into that part of Central America is reflected by the recent increase of capital announced by Duncan y Cossio S.A., which enterprising concern has recently changed to corporate status. The company's chairman, Alex Duncan, states: "Now that Bristol, de Havilland and Redifon have broken the ice for the British aircraft industry in Mexico, there is more business to be done and there is a great future, in particular, for the Avro 748 on the internal routes now operated by 60-odd DC-3s, all of which are quite ready for honourable retirement."

His company, Duncan y Cossio S.A., which represents in Mexico Hawker Siddeley Aviation, Ltd., Redifon and Cossor, as well as other British firms in aviation, marine and general engineering, recently announced the sale of a Redifon Comet Flight Simulator with fuselage movement to Compania Mexicana de Aviacion, whose first two Comets have now been in service Mexico-Los Angeles and Mexico-Chicago for some months and whose third will be ready for delivery from Hatfield shortly. The Redifon Simulator is due for readiness in December. All its 23 tons of electronics will be shipped to Mexico in early 1961.

As we said in our editorial for Sept. 9: "Another specialist field in which the British industry makes a particularly impressive contribution is that of electronics with special reference to navigational aids, aircraft and radar simulators and air traffic control equipment." As the news from Mexico illustrates, the special interest taken in such exhibits at the Farnborough Show results in firm orders.

Matters of Moment . . . .

Good Wishes on Retirement

FRIENDS in advertising and aviation were hosts at a farewell party to Mrs Grace Inglis recently, on her retirement from the *Illustrated London News* where she has been for the past 20 years as advertising representative.

To us since those days in the very early thirties when she was advertisement manager of THE AEROPLANE she has been, and always will be, "Bill." In its three offices at 175 Piccadilly, W.1, the editorial staff of those days was very much of a family and like all families getting on in the world, its members had to live very much in each others pockets. The editorial team, apart from C.G.G., with the advertising manager, shared a single office. In such close quarters tempers could get short. It was generally a flash of wit from Bill that put things right.

We join with her hosts of friends in wishing her every happiness.—T.J.

Conservatives Debate Space Research

"WE are going in for space research. There is, as far as I know, no chance whatever of our withdrawing from it. We think it is a valuable part of our balanced scientific effort." These words were used by Lord Hailsham, Minister for Science, during a debate on space research at last week's Conservative conference at Scarborough. The debate took place on a resolution declaring that the conference "believed that it would be a grave error for Britain to withdraw from space research and favoured the expenditure of a reasonable proportion of the national income on this work." The resolution was moved by Mr. G. Waite (Loughborough).

After drawing attention to the Anglo-American satellite project involving the American Scout rocket, Lord Hailsham said that when these experiments are fully instrumented and in

OLD ORIGINALS.—Those surviving officers who served with the Royal Flying Corps before 1914 recently dined at the Royal Air Force Club in London.

Back Row: Wg. Cdr. W. R. Read, Gp. Capt. G. I. Carmichael, A.M. Sir Patrick A. L. Playfair, Air Cdre. H. le M. Brock, Maj. R. M. Vaughan, Maj. K. P. Atkinson, Wg. Cdr. J. H. Fletcher, Air Cdre. Sydney W. Smith, Wg. Cdr. D. L. Allen, Lt. R. O. Abercromby, Wg. Cdr. C. E. C. Rabagliati, Gp. Capt. R. J. F. Barton, Sq. Ldr. S. C. Winfield-Smith, Maj. H. R. P. Reynolds.
Front Row: Brig. Gen. L. P. Evans, Air Cdre. A. G. Board, Brig. P. W. L. Broke-Smith, A.C.M. Sir Philip Joubert, Marshal of the R.A.F. Sir J. M. Salmond, Air Cdre. R. H. Verney, Gen. Sir Henry C. Jackson. Lt. Col. L. V. S. Blacker joined the party after dinner.

Photograph copyright "The Aeroplane and Astronautics"

SUPERSONICS. — Formally opened by the Minister of Aviation on Oct. 19, these two new wind-tunnels at the English Electric Aviation establishment at Warton have maximum working-section speeds of Mach 4 and Mach 6. They will provide research facilities for missiles, and no doubt for such aircraft as the TSR. 2 and supersonic airliner projects now being studied by the British Aircraft Corporation.

course of execution, "no doubt the scientists will come to us again and ask us to sanction a further series of experiments based, if they so desire, on a rocket with a larger payload or a larger orbit." But he pointed out it would cost Britain between £50m. and £60m. more than had already been spent to perfect a rocket capable of sending a 1,500-lb. satellite into an orbit of 200 or 300 miles. And it would cost another £12m. to perfect the satellite which would be carried by this rocket.

"We are gradually approaching the time," Lord Hailsham continued, "when individual nations will not be able to back all the scientific horses in the race without overstraining their resources. That means we have got to consider each one of a number of alternative policies. . . . We see great advantages and very few disadvantages—if there is to be a future for liquid fuel rockets outside the United States—in clubbing together with other nations to found a group which will use these rockets for a number of different purposes of which pure space research is one.

"Whatever may be the future of the Six or the Seven, any club for space research will include members of the Commonwealth and members of the European fraternity. Therefore there will be in space research, if the plan comes off, very great political and international advantages in working in this way."

The resolution was carried with a few dissentients.

The Air League's 9 Aims for General Aviation

A SUBJECT of great interest at the present time and one on which a lot of attention is currently being focused is that which comes under the heading of "general aviation." By this is meant almost every aerial activity except Service aviation and commercial airline or non-scheduled operations. It embraces, in fact, executive and business flying; utilitarian operations such as agricultural aviation and aerial photography; and the activities of those who fly just for fun. Broadly speaking this is an area of aviation that in this country, in the post-war years, has lagged well behind.

Last week some encouraging news of progress came with the announcement of the formation of British Executive and General Aviation, Ltd. (Beagle) which will concentrate on the design and manufacture of executive and light aircraft. Now, this has been followed with the publication, earlier this week, of a report by the Air League of the British Empire dealing with the subject of general aviation as a whole. The purpose, it is explained, is to call attention to its almost complete absence in Great Britain; to examine its importance; and to make recommendations which it is believed will help to rectify the current deficiency.

After outlining the functions and importance of general aviation the report goes on to explain:—

"The special geographic position of the United Kingdom, and the heavy commercial intercourse with the Continent from which we are separated by the Channel, are precisely the conditions which should stimulate business and executive flying in this country. Furthermore, the congestion of our roads might lead one to expect a high density of internal flights. Despite these conditions, however, general aviation in the United Kingdom is in a bad way. . . .

"One explanation why Great Britain lags so far behind is that in the United States the Federal Aviation Agency is charged with the responsibility of furthering the interests of all classes of aviation, including general aviation. It provides, as a Government service, the radio and air traffic facilities which make possible the economic operation of small airfields and airports. These, like other public utility undertakings, are not necessarily required to show a profit but they provide an essential service to the nation.

"By contrast, our own Ministry of Aviation comprises only the aviation section of the former Ministry of Supply together with the departments extracted from the former Ministry of Transport and Civil Aviation, whose principal function related almost exclusively to the regulation and licensing of the air transport industry and the State-owned airports. The absence of any department to study the needs of general aviation, or advise the Minister on its problems is, in our opinion, fundamentally wrong and one of the basic causes of the difficulties. . . ."

The report goes on to make a number of recommendations for subjects upon which Government action should be taken.

What is Required

- A declared Government policy to expand general aviation.
- Establishment of a department in the Ministry of Aviation specifically charged with implementing this policy.
- The formulation of a national aerodrome and ground facilities policy to bring into being a comprehensive pattern of aviation ground facilities available to all air users.
- The Government to encourage private industry to enter the field of light aircraft manufacture.
- The establishment of a National Flying Trust to replace the Kemsley Flying Trust to provide financial assistance to sporting and flying organizations.
- Reduction of Government charges affecting general aviation, in particular the abolition of the fuel tax on aviation fuels and possibly, for the next two or three years, the abolition of import duty on aircraft and equipment from overseas.
- Pilots and flying organizations should within a reasonable period accept RT as a minimum requirement to be carried and become proficient in its use.
- A simplified version of the "Air Pilot" should be prepared, similar to the Australian publication. Directions and amendments, so far as possible, should be issued quarterly.
- All interests in general aviation should combine to create their own recognized organization to speak with one voice for them all.

In the Air League's opinion general aviation comprises sectors of any nation's total aviation activities "which are so important as to jeopardize the remainder if they remain too long neglected." In fact, it believes that the stage has been reached when British aviation cannot continue to prosper without the support of a healthy general aviation movement, and this must comprise: a lively light aircraft industry; a purposeful and active flying and gliding club movement; an adequate ground organization, including airfields and radio facilities to encourage general aviation; and an enlightened attitude towards the framing of essential regulations affecting air traffic.

The single most important step towards achieving this, says the Air League, is the creation of a small department within the Ministry of Aviation, charged specifically with the task of studying the needs of general aviation, and advising the Minister on the steps necessary for its growth and well-being.

Aviation News in General

HELICOPTER RECORD. — Russia has claimed, as a World record for distance by helicopter, a flight by a Mil Mi-1 from Moscow to Krasnodar, a distance of about 745 miles.

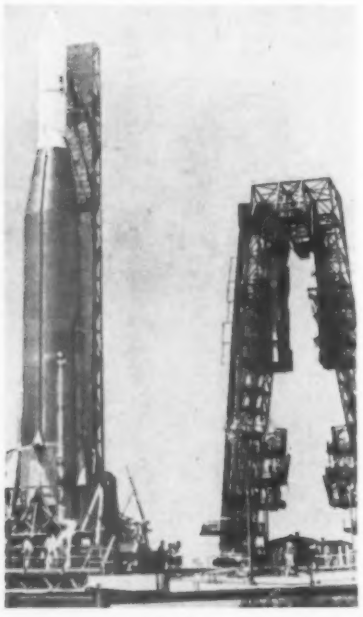
AUSTER FLIGHT.—Two Army Air Corps pilots, Maj. S. Whitehead and Capt. P. Carter, reached Kuala Lumpur, Malaya, on Oct. 11 after flying an Auster out from the United Kingdom for delivery to No. 656 Sqn. The 9,600-mile flight took 25 days.

TURBOPROP CONTRACT. — The Allison Division of General Motors has been awarded a $25,153,000 contract for the production of the T56 turboprops for the U.S.A.F. and the U.S.N. Extending production into 1962, the order covers T56-A-7s for the Lockheed C-130, and T56-A-10Ws for the Lockheed P3V-1.

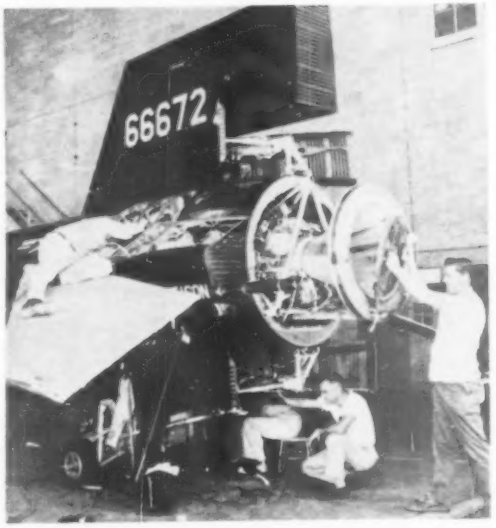
A NEW BREGUET.—A light STOL transport with a blown wing, along similar lines to the Br.941/942 Integral, is being studied. This, the Br.945, would have two Turboméca Turmo IIIB engines driving four propellers to give an airflow over the whole flapped and slotted high wing. The payload of 3,300 lb. could be carried 930 miles at 248 m.p.h.

CANADIAN DOPPLER SALES.—Customers for the Canadian Marconi FM/CW Doppler navigation equipment now include Air France (26 installations), K.L.M. (16 installations), Canadian Pacific Air Lines (12 installations), Irish International Airlines (nine installations), Varig, South Africa Airways, Alitalia, the R.C.A.F. and the U.S. Navy.

BEAVER ORDER.—The Government of Ghana has ordered 14 D.H.C.2 Beavers with initial delivery in December this year. The Beavers will be operated by the Ghanaian Air Force.



NO ORBIT.—Poised for take-off at the newly completed launching site at Point Arguello, California, this Atlas-Agena rocket was intended to carry the first Samos reconnaissance satellite into polar orbit on Oct. 11. It failed to achieve sufficient speed (see page 563).



MORE THRUST.—The new single-chamber Reaction Motors XLR99 liquid rocket engine being mated to a North American X-15 at Edwards A.F.B. Rated at 50,000 lb. s.t., this engine replaces the two 8,000 lb. s.t., XLR11 rocket motors previously installed in the aircraft.

VERTOL GEM.—An Army Transportation Research Command contract has been awarded to Vertol Division of Boeing for a design study and preliminary design of a ground-effect take-off and landing vehicle.

JETSTAR ORDERED.—The Canadian department store of T. Eaton and Co., Ltd., has ordered a Lockheed JetStar, for delivery in mid-1961.

VISUAL AIDS PANEL.—The ICAO panel on visual aids to approach and landing will hold its first meeting in Montreal from Nov. 14 to Dec. 9.

"THE AEROPLANE" DIARY.—Copies of the 1961 edition of THE AEROPLANE Diary are now available from Temple Press Limited, Bowling Green Lane, London, E.C.1. Retaining all the popular features of previous editions, revised and brought up to date, the diary is available in two bindings. The leather edition costs 6s. 6d. (post free 7s.), and the rexine edition costs 4s. 9d. (post free 5s. 3d.).

CHATTERBOX.—The NASA satellite, Explorer VII, achieved its first anniversary in space on Oct. 13 and is still "talking back" to Earth. An automatic timer should have cut off its transmitter after exactly a year to clear the radio channels. Satellite has travelled 145 million miles, completed more than 5,000 circuits of the Earth, and presented scientists with 1,200 miles of magnetic tape recordings. It should remain in orbit 20 or 30 years.

BALLISTIC MICE.—Three black mice—Sally, Amy and Moe—were launched from Cape Canaveral in the nose-cone of an Atlas ICBM on Oct. 13. The trio travelled 5,000 miles, reaching a maximum height of 700 miles, and were recovered "in good condition" when the nose-cone was picked up from the sea near Ascension Island in the South Atlantic. Re-entry body was coated with a new ablative material.

DRY DOCK LAUNCHER?—U.S. Navy is reported to be studying the possibility of using "moth-balled" floating dry docks as mobile launching sites for larger space boosters. One advantage is that they could be towed into position for launching satellites directly into equatorial orbits.

ORBITAL SCOUT.—Next NASA Scout is scheduled to launch a payload into orbit. It will carry either a micrometeorite impact experiment or instruments for measuring air-density. Attempt is expect within the next two months from Wallops Island, Virginia.

IDENTIFIED. — The "piggy-back" satellite of the Naval Research Laboratory, launched in conjunction with the navigational satellite Transit IIA on Jne. 22, has been named Radiation I.

AIR-TO-ORBIT? — A four-stage rocket which can be air-launched at 25,000 ft. as a high-altitude probe or satellite booster is being developed by the U.S. Navy. Designated Caleb, the "all-solid" rocket is 16.5 ft. long, has a maximum diameter of 24 in. and weighs about 3,000 lb. Launching technique at high angles is similar to that of "toss" bombing.

MERCURY METALS.—A change has been made in the outer skin of the Mercury space capsule, ribbed titanium being replaced by a lower cone of Inconel and a cylinder of beryllium shingles.

RIGID "BALLOON."—A "stiffened" inflatable balloon satellite, capable of maintaining its shape longer than Echo I, is being considered by NASA. The first Echo satellite is expected to remain in orbit about one year.

HIGH-G.—Chance Vought has been awarded a U.S.A.F. contract to develop a restraint system to protect a space-pilot against landing impact forces as high as 60g.

ON GUARD.—Total operational strength of Atlas ICBMs in the United States is now 12, six being on full-time alert at Vandenberg A.F.B. and six at Warren A.F.B.

Commercial Aviation Affairs

LAST ATLANTIC COMET.—On Oct. 15 B.O.A.C. operated its last North Atlantic service with the Comet 4 which inaugurated oceanic turbojet services on Oct. 4, 1958. A total of 94,000 passengers have been carried by B.O.A.C. Comets on these services.

SUDAN FRIENDSHIPS.—Sudan Airways has ordered three Fokker F-27s, in the Series 200 version with Dart R.Da.7s. The order, which brings the total of Friendship sales to 168, is the first from an African operator. Deliveries will be made next year.

AUGUST TRAFFIC. — Provisional statistics show that U.K. airlines traffic on scheduled and inclusive tour services amounted to 59 million short ton-miles—an increase of 21% on the figure for August, 1959. The overall load factor fell from 65% to 64%.

707s WANTED.—In its 65th market report Aircraft Exchange states that a "reputable financial organization" wishes to buy four Boeing 707-120s for lease purposes. Early delivery—one as soon as possible and the others not later than April, 1961—is essential and for this the buyer is expected to be ready to pay a heavy premium above the depreciated book value.

MORE CARAVELLES FOR U.S.—Continental Airlines is reported to be considering the purchase of 14 or 15 Caravelle 6/7s for its medium-haul services.

25 MILLION.—During September B.E.A. carried its 25 millionth passenger, with a total of five million in the past 15 months.

ROADAIR TO HOLLAND.—Last Monday, Oct. 17, Silver City started Roadair services between London and Tilburg in Holland. Freight will be flown between Manston and Ostend.

DC-8 POLAR SERVICE. — S.A.S. made its inaugural DC-8C flight from Copenhagen to Tokyo on Oct. 11/13 in a flying time of 16 hr. 21 min., passing over the North Pole. The DC-8, "Rurik Viking," had called at Bodöe, Northern Norway, to open the new 10,000 ft. runway there.

SECOND TURBOFAN.—On Oct. 6, the first Boeing 720B, with P. & W. JT3D-1 turbofans, made its first flight. It is one of 15 ordered by American Airlines, and follows the first turbofan-powered 707-120B, which has now logged 140 hours, including 20 hours of F.A.A. testing.

ICAO IN THE CONGO.—A technical assistance mission from ICAO has been largely responsible for the maintenance of civil air operations in the Congo since July, in the face of extreme difficulties. An account of the mission's work has now been presented to the ICAO Council, and shows that a team of 26 experts has been recruited from nine countries to provide air traffic control facilities and to organize training programmes for Congolese nationals.

THE MOSCOW ACCIDENT.—The Austrian investigating committee believes that the cause of the Austrian Airlines' Viscount accident near Sheremetievo Airport on Sept. 26 was due either to a fault in the altimeters or to misreading by the pilot(s).

ELECTRA FINDING.—The U.S. Congress Aviation Sub-committee has found no reason for grounding the Electra after the Boston accident on Oct. 4. The committee found that the Electra lost the power of one and possibly two port engines but that no structural failure was involved; there was no conclusive evidence to suggest that starlings were sucked into the intakes.

LOSS IN ITALY.—A de Havilland Heron operated by Itavia, the Italian local operator, failed to arrive at Genoa on a flight from Rome on Oct. 14. Seven passengers and a crew of four were on board. No trace of the aircraft had been found when this issue went to press.

News About People

M.L. AVIATION BOARD.—Mr. A. J. Shirley, chief draughtsman of the M.L. Aviation Co., Ltd., has recently been appointed to the company's board; he will continue to be chief draughtsman. He joined M.L. Aviation in 1941.

FIELD APPOINTMENT.—Mr. Derek Lee, Field Aircraft Services' commercial manager, has been appointed to the board as sales director.

TRADAIR CHANGE.—Mr. Henry Porter, formerly sales manager of the British independent Tradair, has been appointed personal assistant to Mr. E. S. Hanks, the commercial director, with full authority in the day-to-day commercial operations of the company. Mr. Peter Dorrington has taken charge of the commercial office.

R.A.F. CONTROLLER.—Air Vice-Marshal C. Scragg, C.B., C.B.E., A.F.C., has become Deputy Controller (R.A.F.) at the Ministry of Aviation.

B.I.S. PRESIDENT.—New president of the British Interplanetary Society is Dr. W. R. Maxwell, B.Sc., Ph.D., of R.P.E., Westcott; he succeeds Dr. L. R. Shepherd, B.Sc., Ph.D., who has held the position for the past three years. Vice-presidents are Mr. M. J. Brennan, B.Sc., M.I.Mech.E., F.R.Ae.S., director and chief engineer, Folland Aircraft, Ltd., and Mr. K. W. Gatland, F.R.A.S., astronautics and missiles editor, THE AEROPLANE AND ASTRONAUTICS.

AEROPREEN APPOINTMENT. — Mr. Andrew N. Combe, M.I.W.S., has been appointed to the newly created post of chief planning engineer of Aeropreen, Ltd., High Wycombe. Prior to joining Aeropreen he was with a work study consultancy.

MEMORIAL SERVICE.—A Memorial Service for Mr. Richard Fairey will be held at the R.A.F. church of St. Clement Danes on Wednesday, Oct. 26, at 11.30 hrs.

J. H. POLLARD.—We regret to record the death in Coventry of Mr. J. H. Pollard. An aircraft accessory specialist, he joined the British Thomson-Houston Co. in 1920 and for many years was the company's chief draughtsman for aircraft equipment.

NEW ZEALAND VISITORS.—Air Vice-Marshal Sir Leonard Isitt, chairman of New Zealand National Airways and Tasman Empire Airways (second left), visited Westland Aircraft last week. He is seen with (left to right) Mr. H. J. Penrose, Westland sales manager; Capt. J. J. Busch, N.Z.N.A.C.; and Col. Richardson, Westland's London Manager.

Air Transport

Scandinavian-U.S. Air Agreement Talks

THE Scandinavian-American air agreement talks which began on American initiative between civil servants from Denmark, Norway, Sweden and the U.S. on Sept. 12 in Copenhagen, ended on Sept. 28 without any results, writes a correspondent from Denmark.

The talks were concentrated on disagreements regarding the capacity rules in the agreements. The Americans had asked for statistics about the S.A.S. traffic from the U.S. via Scandinavia to other countries, but the Scandinavian countries would furnish information only about passengers to and from Hamburg and Prestwick on their transatlantic services, as they were of the opinion that they had no obligation to give information about further traffic.

The nub of the matter is that American operators want to restrict S.A.S. (and other European carriers) with regard to transatlantic traffic, while S.A.S. not unnaturally wants to continue its services under the same rules as have been used since the War.

Under these existing arrangements, considerable latitude is allowed in the matter of frequency. An examination of the *ABC World Airways Guide* shows that during September S.A.S. were operating up to 27 services a week (DC-7C and DC-8) between Copenhagen and New York, some via Hamburg and Prestwick; in addition there were five services a week "over-the-top" to Los Angeles. By comparison, Pan American were operating three services a week to Copenhagen via London and Hamburg and one a week to Stockholm and Oslo.

The Old Order Changeth

TWO interesting points are made in the *Report of the Air Transport Advisory Council* for the year ended Mar. 31, 1960—probably the last to be issued under that title. These concern what are described as "spurious 'closed group'" operations and the sharp fall in the number of inclusive tour service applications for that year.

The "closed group" difficulty will not be repeated; one of the objects of the 1960 Civil Aviation (Licensing) Act has been, as the report puts it, to bring such services "under proper control." Until the passing of this Act, services catering for bona-fide "closed groups" did not need to be licensed and the report is tartly severe about the way in which more and more services appeared to cater for groups which had "little or no purpose apart from the provision of cheap travel and whose membership is not limited so as effectively to prevent people joining merely to secure that particular benefit."

Since it has now been ordained that all air services—other than those involving charters which are not sub-let—shall be licensed, the matter is now closed. But it is a little difficult to accept the validity of complaints about the events of an air transport era which was just a little less heavily controlled. As *The Economist* put it last week, why should it be felt that "there is something improper and un-British in wanting to travel cheaply?"

This natural diversion of traffic is one of the reasons given in the report for the fall in the number of inclusive tours. Another was the fact that more I.T. groups were being accommodated on normal (B.E.A.) scheduled services. There was, too, a specific reason in the fact that consideration of applications by Independent Air Travel was deferred by the Minister of Transport and that this carrier was not operationally cleared for licensing. The report added that "large numbers of holiday passengers were, in fact, carried by the company—or by its successor, Blue Air, Ltd.—but they were not carried on services approved under associate agreements."

Another small comment hidden in the report is worth repetition. After tabulating the growth of traffic carried by the two Corporations and the independent companies, and pointing to the fact that the latter's traffic had increased at a greater rate, the report adds that "the Council do not consider that the operations of these companies have to any material extent adversely affected the growth of the traffic of the Corporations."

Convair Variant

SEVEN major points distinguish the Convair 880-M from the original Convair 880 jetliner, according to the makers. As we recorded last week, the first 880-M, modified from the prototype 880, flew at San Diego on Oct. 3. Of the total of 93 Convair jet transports on order, 14 are to be 880-Ms; announced contracts include three for Japan Air Lines and one each for Avensa and C.A.T.

Improvements and changes in the 880-M are listed as follow:

1. Installation of four slats on the leading edge of each wing, two between the engine pods and two outboard.
2. A power boosted rudder to improve control in the asymmetric power condition at lower speeds.
3. Use of 11,650 lb.s.t. General Electric CJ-805-3B turbojets in place of the 11,200 lb. -3s in the original 880.
4. Structural provision for increased fuel capacity, at customer's option, of 1,540 Imp. gal. This gives an increase in range of 780 st. miles, and has been specified by all three airlines mentioned above.
5. A new proportional anti-skid braking system, which increases and decreases pressure gradually to obtain maximum braking effect short of the skid on slippery runways.
6. A new landing gear to cope with increased weights of the 880-M, which are: max. take-off, 191,000 lb. (compared with 189,500 lb.); max. landing weight 155,000 lb. (145,000 lb.) and max. zero fuel weight, 121,500 lb. (120,000 lb.).
7. A retractable tail skid has been introduced, because of the higher ground angles assumed by the 880-M at take-off and landing, in consequence of the l.e. slats.

Some versions of the 880-M will be equipped to handle preloaded cargo bins, including mechanical bin moving equipment in the floor of the cargo hold. Interior layouts will vary, the maximum capacity being the same as that of the 880—88 in an all-first-class, four-abreast arrangement, or 110 in an all-coach five-abreast layout.

Towards a Supersonic Transport

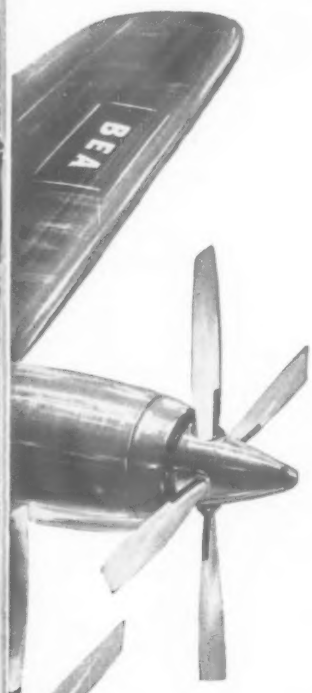
PRELIMINARY studies now being made by the U.S. Air Force for a supersonic transport envisage an aircraft with a 3,500 naut. mile range and able to carry a 60,000 lb. payload. According to Brig. Gen. W. W. Smith, deputy director of operational requirements, the aircraft would be required to operate from existing airfields and the speed would be "just under the thermal barrier." This latter remark suggests a speed of about Mach 2.2, if the thermal barrier is taken as indicating the limit for non-steel structures. In writing a specification for a supersonic transport, the U.S.A.F. is consulting with the F.A.A. in order to incorporate commercial requirements as far as possible.

A spokesman indicated that the U.S.A.F. would develop a supersonic transport in due course but was not yet ready

(*Continued on page 555*)

FLAPPED NOSE.—A detail of the Convair 880-M wing, showing the four-section leading edge flaps which are one of the distinguishing features of this version. A note on the 880-M appears above.

The longest queues are for the cheapest seats



People want to travel. They want to travel quickly. They want to travel cheaply.

Economy fares offered by airline operators have turned these requirements into record traffic figures. During 1959, 72% of all North Atlantic passengers flew 'Economy Class' and on U.S. domestic trunk lines Coach Class travel held a record share (43.6%) of the market. In Australia cheap fare travel has increased by 102%.

These results were obtained with existing aircraft. The Vickers Vanguard has been specifically designed to cater for mass air travel at low fares and presents airline operators with the finest opportunity of gaining an even more profitable share of this great expanding market.

The cheapest seats are in the

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

Member Company of **BRITISH AIRCRAFT CORPORATION**

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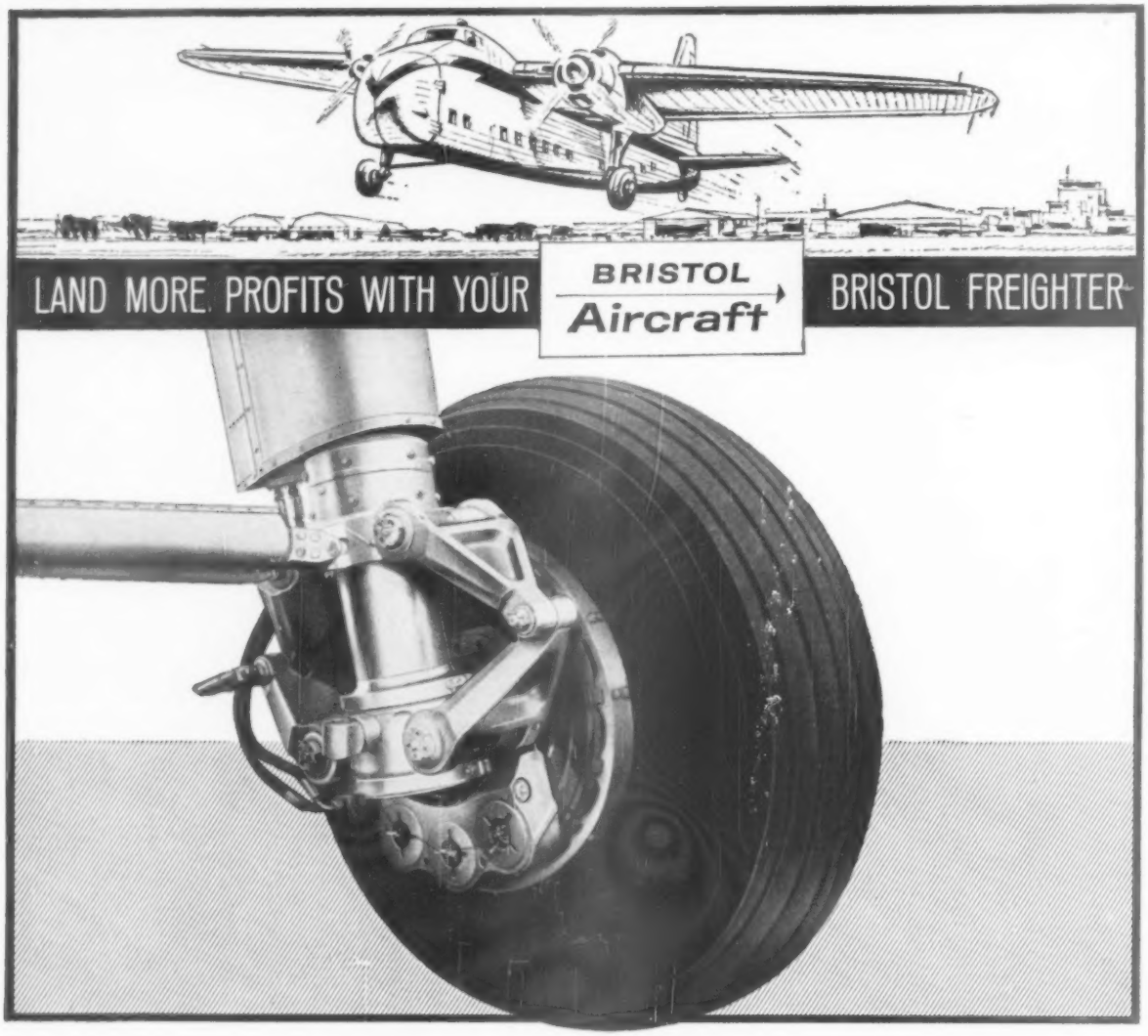


GOODYEAR WHEEL AND BRAKE CONVERSION

Following the world-wide acceptance of the Douglas D.C.3 and D.C.4 brake conversions, Goodyear has introduced a Single Disc Wheel and Brake conversion unit adaptable to any Bristol Freighter. Its high efficiency and reduced maintenance time make possible quicker turnround with reduced operating costs per trip. The conversion has already been performance-proved on aircraft operated by Silver City Airways Ltd. from Ferryfield and Channel Air Bridge (Aviation Traders) Ltd. from Southend. These two Companies have had this profit-building conversion applied to 23 aircraft. The Bristol Freighters operating from Ferryfield make *three landings per hour*—probably the highest frequency of wheel and brake usage for Airline operation in the world.

- Low maintenance and replacement costs
- High efficiency—quicker turnround
- Increased wheel life—7,500 landings before crack detection is needed
- Pneumatically-operated emergency air system incorporated to latest ARB requirements
- Designed for simple maintenance in the field
- Manufacturer's overhaul facilities available

GOODYEAR AVIATION DIVISION

SERVING AVIATION THE WORLD OVER

Air Transport . . . .

(*Continued from page 554*)

to go ahead. The possibility of producing transport versions of the U.S.A.F.'s two supersonic bombers is, meanwhile, still being canvassed. Convair last week illustrated a transport based on the B-58 Hustler, having a new fuselage on basically the same wing. Such an aircraft, operated by the U.S.A.F., would, said Convair, be used to gather data for production later of supersonic airliners for commercial airlines.

A transport variant of the North American B-70 Valkyrie could be flying by late 1963, according to a recent report of the U.S. Senate's Preparedness Investigating Sub-committee. Assuming a first flight of the prototype B-70 before the end of 1962, this committee indicated a "minimum modification" transport could be flying in 1963 with the same J93 engines specified for the B-70. By mid-1966 this could be followed by a more extensive modification for MATS, with a major re-design of the fuselage, and this in time could give rise to a commercial prototype, for certification by the F.A.A. to begin in mid-1967.

Powered by turbofan engines, this commercial transport would fly at 1,980 m.p.h. (Mach 3) at 70,000 ft. and would be able to use most of the major World airports. Allowing for extrapolated currency inflation factors and assuming 90 passengers (mixed class) and 3,000 hrs. utilization a year, the committee estimated the seat-mile costs of this aircraft in 1968 to be 2.5 cents transcontinental and 2.75 cents intercontinental.

B.O.A.C. Flight Operations

AS we briefly recorded last week, B.O.A.C. has appointed Capt. Dennis I. Peacock to be its chief of flight operations, in place of Capt. T. H. Farnsworth, whose resignation we reported in our issue for Sept. 16. Capt. Peacock, who is 54, had been manager, flight operations, until taking up this appointment. He joined Imperial Airways in 1935, was promoted captain in 1938 and flew extensively on Empire and Atlantic routes until 1948, since when he has held several important ground appointments.

Capt. D. I. Peacock (left) and Capt. John Woodman.

Capt. John Woodman has been appointed to the newly created post of chief pilot on the staff of the chief of flight operations. In this position, he will continue flying on service and will be responsible for the maintenance and improvement of operational procedures and standards of airmanship on all B.O.A.C. routes and aircraft. Aged 45, he had been flying on Atlantic services since 1943 and was deputy flight manager of the Boeing 707 flight at the time of his new appointment. He joined Imperial Airways in 1936 and became a captain in 1938.

The Air-freight Business

FROM time to time in this column we have tilted at the complicated windmill of the air-freight rate structure. In an article in last month's issue of the U.S. journal *Air Transportation*, Mr. Alvin B. Beck, executive vice president of the Air Express International Corporation, has some really vigorous and new things to say about this side of the business.

He writes to the effect that there can be no air-cargo "breakthrough" (an overworked word) until the rate structure has been radically modified. He also points out that IATA members must adhere to this Association's tariffs and deduces that "breakthrough rates" may, for this reason, have to wait until a sizeable number of airlines have all acquired correspondingly economic air freighters. In this he is referring particularly to the position of Seaboard and Western, which is an IATA member, and which has CL-44s on order.

Mr. Beck writes that the structure around which the present rates are built is "unrealistic, unscientifically established, literally a compounded creature of a haphazard beginning. The structure was wrong to start with, and all the subsequent upward and downward revisions by edict of the International Air Transport Association apparently did not know how to correct it. In the air-shipping fraternity it is no secret that there have been numerous rate revisions by rule of thumb and by just plain politicking and horse-trading. The rates which evolved may have helped to increase air-freight traffic to a certain extent (it should be noted that there is a natural growth factor as well), but they failed to improve the economic health of the industry in comparable measure."

He points out that, with the new IATA North Atlantic rates, introduced in April this year, many commodities which had already been moving well, and which easily absorbed the original rates, had the benefit of a reduction—yet the increase in traffic so far has not been great enough to offset the steeply reduced yield per pound.

The economics of the air-freight business, he writes, is "long past due" for the "closest and most astute sort of re-examination, from the ground up, with a totally revised and coldly realistic rate structure as the ultimate objective."

Now, Mr. Beck concludes, is the time to lay a new foundation for the rate structure.

The Last Word on Munich?

TWO years and eight months after the B.E.A. Elizabethan carrying the Manchester United football team, and others, crashed in attempting to take off from Munich, there was published last week the report of the reviewing body set up by the Minister of Aviation to consider "certain matters connected with the accident." The report (H.M.S.O., price 8s.) reconstructs with meticulous care the sequence of events on that tragic afternoon, Feb. 6, 1958; it is an outstanding example of concise, detailed and objective investigation into the circumstances of an accident.

Comprising Mr. E. S. Fay, Q.C. (chairman), Prof. A. R. Collar and Capt. R. P. Wigley, the independent reviewing body was set up in June, 1959, to consider whether Capt. Thain (the surviving pilot-in-command of the Elizabethan) had taken sufficient steps:—

(a) to satisfy himself that the wings of the aircraft were free from ice and snow;

(b) to ascertain whether or not in the conditions prevailing at the time the runway was fit for use; and

(c) to ascertain the cause of the difficulties encountered on the first two attempts to take off before making a third attempt.

It was, therefore, not the job of this body to investigate the causes of the accident itself. This had already been done by a German Commission of Inquiry, whose report had been published earlier in 1959. Both Capt. Thain and BALPA disagreed with some aspects of this report, which gave as the primary cause of the accident an accumulation of ice on the wings. In seeking to establish the facts, however, the reviewing body found it necessary to go over much of the evidence taken by the German court, and reached rather different conclusions in the light of that evidence.

Specifically, the reviewing body states that the conclusion reached by the German court is not reconcilable with Capt. Thain's evidence, and that it is unable to make any useful deduction as to either the presence of ice or the degree of slush drag. The presence of slush on the runway had been suggested by Capt. Thain as the primary cause of the accident, but was discounted by the German court.

At the time of the accident, very little was known about slush drag. More is known now—partly as a result of this accident—and it now appears that certain assumptions by the German investigators were invalid in this respect. An Appendix to the present report, by Prof. Collar, is itself a valuable contribution to the study of this whole subject and, incidentally, puts forward a highly plausible hypothesis for the sequence of events on the final take-off attempt.

Whilst it is stressed that this is only hypothesis, it does show that there is nothing improbable in Capt. Thain's account; that the accident can be explained without postulating wing icing; that slush drag is of vital importance; and that slush density is of equal importance to slush depth.

Having said all this, however, the reviewing body comes firmly to the conclusion that Capt. Thain did not take sufficient steps to ensure that the wings were free from ice; this conclusion, it is noted, has nothing to do with the presence or otherwise of ice on the wing. In respect of the runway conditions and the causes of the two abortive take-off attempts, Capt. Thain is considered to have done all that was required of him.

BALPA, which has recently been criticized for its position over the Munich accident investigation, stated last week that it accepts the findings of the reviewing body.

Air Transport . . . .

NAFEC on Show

Howard Levy reports from Atlantic City

An aerial view of NAFEC, the Federal Aviation Authority's experimental airport at Atlantic City. The main runway is 10,000 ft. long, the others being 6,000 ft. and 5,600 ft. Two hangars and more than 100 other buildings provide more than 750,000 ft. of floor space.

ON Oct. 1, the Bureau of Research and Development of the Federal Aviation Agency held its Second Annual General Aviation Fly-In to its National Aviation Facilities Experimental Center, Atlantic City, New Jersey. A bright, clear day brought along some 450 visiting aircraft and approximately 2,000 people (some by cars), to view the work being carried on by the F.A.A. at this former U.S. Navy base.

The Center is staffed by more than 300 engineers and technicians engaged in research, experimentation, development and evaluation of 84 formal projects covering aids to air navigation. These projects are divided roughly into eight main divisions: systems research, aircraft, data acquisition, data processing and display, navigation, communications, airports and weather.

The visitors, the great majority of whom were private pilots, were able to see the various runway lighting installations undergoing evaluation; the British VGSI; distance measuring equipment (TACAN); air traffic management displays; REGAL glide slope; air traffic control radar beacon; F.A.A. test aircraft including Douglas DC-3s, C-131s, Grumman Gulfstream and F9F-8T, Piper Tri-Pacer, Aero Commander, Grumman SA-16A, Sikorsky HR2S-1, Bell 47G-2 and others.

Other displays and demonstrations concerned computors, telephone communication, AGACS (automatic ground-to-air communication), simulators and radar. Off-NAFEC navigational sites visited were the Doppler VOR installation, AHSR (air height surveillance radar) site and Bendix FPN-34 surveillance radar position—all new navigational aids undergoing installation and evaluation.

Right, the photo-theodolite and range control tower at NAFEC. Four photo-theodolites are used to photograph aircraft positions on the runway, for later evaluation.

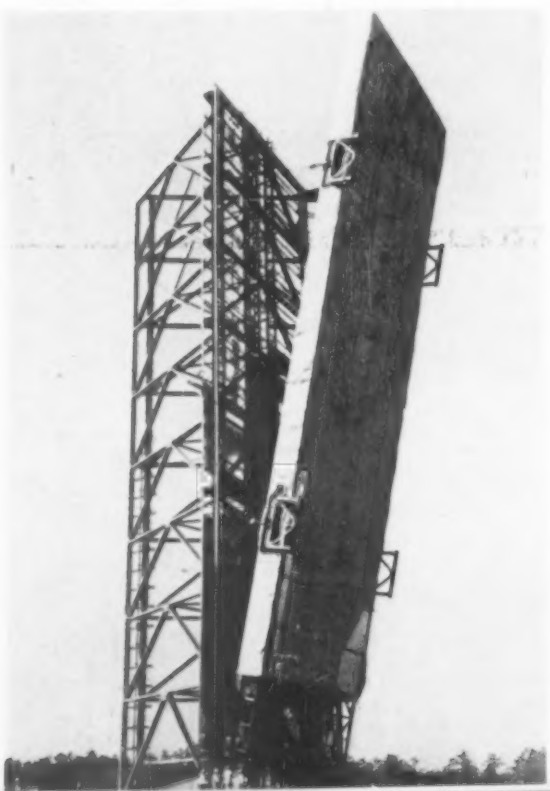
Talks were given by James T. Pyle, Deputy Administrator, F.A.A.; James L. Anast, Director, Bureau of Research and Development; and Dr. James L. Goddard, Civil Air Surgeon, Bureau of Aviation Medicine. NAFEC personnel informed everyone that the facility was for those connected with aviation and that there was a standing invitation to "drop in" any time to see how things were progressing.

Among the equipment shown was the R.A.E.-developed visual glide path indicator, now designated visual glide slope indicator (VGSI) by the F.A.A. One of five systems evaluated at Atlantic City, the British version was recommended as the best by the Bureau of Research and Development, and has now been adopted by the F.A.A. as a national standard (see our issue for July 15, 1960).

British Equipment on Trials

The VGSI is in operation on the 10,000-ft. Runway 13 at Atlantic City, with the glide slope adjusted as nearly as possible to coincide with the ILS glide slope at 2.6 deg. The system consists of 12 light boxes with three lamps in each. The first six boxes are located 750 ft. from the runway threshold, three boxes each side of the runway. An additional six boxes are located farther out at 1,250 ft.

Although the NAFEC installation uses British-built boxes, some modifications were made. The boxes have been placed on 20½-in. legs so that the tops of the fixtures are even with the crown of the runway. The original Thorn lamps could not be used and therefore were replaced by 200-watt, 20-amp. Sylvania lamps. Also the original filters, which had plastic colour



Left, the AHSR-1 (air height surveillance radar) recently installed at NAFEC gives aircraft altitude information up to 40,000 ft. over a radius of 200 miles. The first of three 135-ft. tall waveguide panels is here seen being raised into position on the tower.

This arctic-type hut contains Bendix AF/FPN-34 (XW-1) medium-range surveillance radar, with a range of 140 miles and height coverage of up to 60,000 ft.

Four instrument landing systems are under evaluation at NAFEC. This picture shows part of the REGAL glide slope equipment.

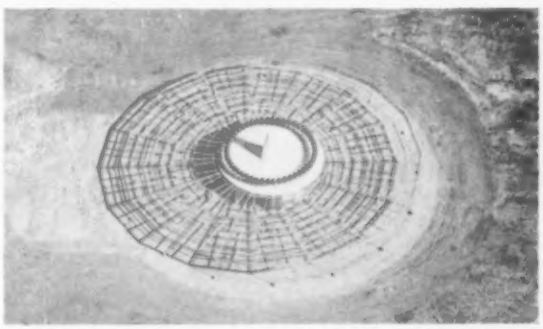
sprayed on glass, were found to split and turn yellow due to the heat. These filters have since been replaced by all-glass filters.

The units have a five-step brightness control from full or 100% brightness, down to step one with about a half of 1%. The divided red-white lens in front of the lamps spreads the beam and also decreases the intensity, the red filter allowing through about 17% of light strength. The Sylvania lamps throw a 120,000-candle-power beam at the white section and on a bright day during daylight may be seen from about a four-mile distance and six to seven miles on a clear night.

The NAFEC VGSI installation cost a total of $12,000; $7,000 for the 12 boxes and lamps and $5,000 for airport installation. However, Sylvania is to produce modified boxes under licence in the U.S. at approximately $350 per unit on a mass-production basis.

The R.A.E. system at NAFEC has been in operation since February, 1960, and tested by a wide cross-section of pilots and aircraft types. According to Lt.-Col. R. S. Griffith, U.S.A.F. pilots of Boeing 707s and KC-135s who evaluated the system were particularly enthusiastic. Following the selection of the R.A.E. equipment, the U.S.A.F. conducted an intensive operational suitability test to determine its usefulness with the latest operational fighters and bombers.

Sixteen pilots flew 180 approaches, both day and night, in all the Century fighters and the B-47 and B-52. This test verified the earlier evaluation, with all pilots reporting favourably on the device, and with all pilots considering that a requirement exists for a visual glide slope system under certain conditions—



This Doppler VOR installation at NAFEC covers a 500 ft. diameter site. The system employs 50 antennae compared with the usual four.

notably at night with unlighted surroundings and with terrain problems.

Of the fighter pilots, the F-100 pilots were the most enthusiastic, one reporting that, in 700 hours of F-100 time, he had never made a night landing completely relaxed or free of anxiety until he flew in the test of the R.A.E. system. At night, all the pilots found the range to be in the order of five or more miles, and in daylight, at least three miles. All reported the system was easy to fly, and with no problems of interpretations or of learning the presentation of the signals.

Evaluation is now continuing with a view towards reducing the number of required boxes and yet providing a workable system; thereby the development of an even less expensive VGSI system for smaller airports may become possible and is one of the F.A.A.'s aims at the present time.

Some of the other items on show at NAFEC are illustrated on these pages; others will be described in greater detail in the future.

Above, the R.A.E.-designed and Thorn-developed VGSI installation at NAFEC, showing the sets of triple-lamp mounts; identical sets are located on the other side of the runway.

Right, air traffic control studies are a major part of NAFEC's work. Signals from the simulators shown here are fed to radar screens on which controllers work out procedures, location of aids, traffic patterns, etc.

The Aerodrome Owners Get Together

WITH a particular interest in expediting the movement of as many people as possible from A to B with a minimum of formality, the owners of U.K. non-State aerodromes made a singularly happy choice in Folkestone as the venue for their Association's 1960 annual conference. As the Mayor, ALDERMAN F. W. ARCHER, said in his welcome to the 110-odd delegates, although Folkestone has no aerodrome of its own it has close ties with air traffic through its association with Lympne and Ferryfield. Indeed, this particular area has seen the introduction of an entirely new form of civil air travel in the cross-Channel aerial car ferry service which has now become one of the major components of our air transport industry.

Once again the conference was notable for the liveliness of its proceedings and the excellence of the arrangements made by the Association's secretary, Sqn. Ldr. A. W. Day. After a lecture session at which three topics of particular interest to the delegates—Customs facilities, fire fighting and transport helicopters—were aired and discussed, visits were made to Lympne and Ferryfield, as the guests of Skyways and Silver City, to see local aerodromes in action. And just to give perspective to the aviation scene, the delegates were first treated to a close look at the Dover Harbour car-ferry terminal which can deal with some 3,000 cars a day.

The conference proper was opened, appropriately enough, by the Controller of Ground Services at the Ministry of Aviation, AIR VICE-MARSHAL SIR LAURENCE SINCLAIR. He succeeded in injecting a nice air of enthusiasm into the proceedings right at the start by roundly declaring that civil aviation in this country was on a flood tide and had at last made an impact on the public. He paid a tribute to the part played by the A.O.A. in helping to make the man in the street realize that mass travel by air was now a possibility.

In expressing the desire of the Ministry to help in this respect, Sir Laurence made reference to the particularly difficult problem of air traffic control in relation to the cross-Channel services. In fact, he referred to it as the most difficult A.T.C. problem in the United Kingdom. He agreed that it was something that was urgently in need of solution.

(Some sort of scale to this problem is given by the fact that during the peak summer season no fewer than 900 low-level short-haul aircraft are airborne every day over the Channel area. Ferryfield alone deals with a car-ferry movement every 3-4 minutes).

MR. CHARLES NEWTON from Sywell and Mayor of Northampton—whom everyone was glad to see at the conference—proposed a vote of thanks to Sir Laurence.

Thoughts on Heliports

The highlight, aeronautically speaking, of the academic side of the conference was undoubtedly MR. RAOUL HAFNER'S stimulating presentation of: "The Case for Helicopter Transport in the United Kingdom." At least, that was the published title; the distinguished lecturer's actual talk was based on a very liberal translation of it which should really have been "The Case for the Tandem-rotor Helicopter and the Westland/Bristol 194 in Particular." In point of fact this was in essence the same talk as that given by Mr. Hafner in Paris recently (THE AEROPLANE AND ASTRONAUTICS, Oct. 7). But this made it none the less interesting and the delegates thoroughly enjoyed a very instructive hour of Raoul Hafner's unbounded enthusiasm.

One section of his talk was of especial interest to the conference because it offered some thoughts on heliports—a subject with which many aerodrome owners are closely concerned. Having made the point that unless city-centre operations were considered, the time saving offered by helicopter transport would be insufficient to justify the services, Mr. Hafner went on to develop the theme that because of the high cost of ground in city centres, roof-top heliports were the best solution. The use of the upper floors of buildings would reduce costs. With the advent of electrical and diesel engines, railway stations could now be quite low so that above them there could be two or three floors for say garage and car-park facilities and above that again a floor or two for the heliport.

Mr. Hafner underlined the necessity of combining a heliport with some other facility if uneconomic expenses—and, therefore, large terminal charges—were to be avoided. For the helicopter operated over the shorter ranges, the en route operating costs were relatively less important than the terminal costs which could represent a high proportion of the fare.

If the helicopter services were to be really useful they would have to be continuous day and night. This would pose a serious noise problem but this could be alleviated by having a heliport in a railway station area.

Mr. Hafner emphasized that the railway-station heliports would only be pick-up and set-down points; maintenance and servicing work on the helicopters would be done at bases elsewhere. In this context, he said that a twin-engined machine with one engine failed could be flown light from the city centre to the engineering base but the need to cater for a further en route failure demanded four-engined helicopters.

So far as size of heliports was concerned, he proposed a 300-ft. square with a centrally situated passenger access building and control tower. This would offer reasonable into-wind operation simultaneously on two strips measuring 300 ft. by 100 ft. and separated by a 100-ft. strip. Turn-round times would be very short with the helicopters staying on the platform for as little as six minutes. At peak periods this could mean 10 helicopter movements per hour on each strip and a total of 20 movements per hour for the whole heliport.

In the discussion which followed, one speaker contended that it was not quite so easy as Mr. Hafner had suggested to build heliports over railway stations or bus stations. He felt that better sites would be over rivers in inland areas and over harbours in coastal towns, where this was possible. These solutions would also cater for the safe approach problem and the question of noise nuisance.

Mr. Hafner agreed that railway and bus stations were not the only ideal sites for heliports. He reaffirmed, however, that the biggest problem would be the noise because the operation of day and night services was essential. The fact that helicopters would get bigger and noisier had to be faced and it was essential to find areas that were "noise insensitive."

Essential Formalities

A subject of considerable importance—and, one gathers, a somewhat contentious one among some aerodrome owners—is that of the provision of Customs facilities. Some of the problems involved and the underlying philosophies were most ably dealt with by MR. R. W. RADFORD, a senior member of H.M. Board of Customs and Excise. He explained that the yardstick by which it was determined whether an airport should be granted full-time Customs staff was 1,000 foreign movements a year. On the other hand concessional facilities were granted at airports with much less traffic than that, where it was likely that this might lead to the building up of traffic in the future.

The Customs authorities, said Mr. Radford, were always prepared to consider airports with reasonable prospects of foreign-going traffic. He made a very strong plea, however, that realistic estimates of expected traffic be submitted by those concerned. These were sometimes very optimistic and no one benefited from the presentation of inflated estimates.

A nice point was raised in the subsequent discussion by MR. B. COLLINS of Southend. He suggested that the Customs regulations relating to private aircraft might follow the lines of those for small private yachts. These were, he said, encouraged to clear outward, but were not forced to do so.

The answer given was that in general, official policy was not to discriminate in favour of either air or sea traffic; in comparable circumstances comparable treatment would be afforded. And, by way of encouragement, Mr. Radford added that in the near future a lot of attention would need to be given to the case of private aircraft; the yacht problem would be borne in mind.

The conference next had its attention drawn from Customs to crashes and to the progress made in the development of dry chemical extinguishants. The speaker was MR. H. G. CLEMENTS, managing director of John Kerr and Co. (Manchester), Ltd. Dry extinguishant—in powder form—was, said Mr. Clements, much more effective than CO_2 and approximately four times as fast weight for weight.

Standard dry chemical suffered the disadvantage that if it were used before, or simultaneously with, foam extinguishant there was a considerable breakdown of the foam blanket. However, "compatible" dry chemical using different flow agents to the magnesium stearate used in the standard chemical, had now been developed; it appeared to be faster in action and did not affect the stability of the foam blanket.

The following day delegates had a chance to see for themselves the efficacy of dry chemical extinguishants and high-discharge-rate foam dispensers. Mr. Clements had kindly arranged for some of his company's products to be demonstrated during the visit to Lympne.

Welcomed at Lympne by MR. ERIC RYLANDS, the delegates were able to inspect the excellent new lounge extension and the amenities for Skyway's coach-air-coach passengers. At Ferryfield they were made welcome by MR. D. KINNEAR and were left in no doubt as to the efficiency of the unique Silver City car-ferry organization.—F.T.M.

Informing Local Opinion

ONE of the problems for local authorities in considering airport and other associated developments is that of finding ways and means of informing themselves and representative ratepayers of the value of any expenditure and of the traffic prospects for the future.

There are communities—such as that of Hull—where no air transport facilities yet exist and previous experience (Hull's pre-war Hedon was one of the first six municipally owned aerodromes in the country) may have left them in a very cautious frame of mind. They cannot be blamed for this caution, even though air transport is now really beginning to have something to offer.

A prospectively valuable method of providing this information—and one which could be much further developed—was demonstrated last week by the Brough branch of the R.Ae.S. A meeting was staged at which a strong case for air traffic facilities was first made in a paper; the problems were then commented upon by a panel of four and the meeting then thrown open to questions and comments from the floor.

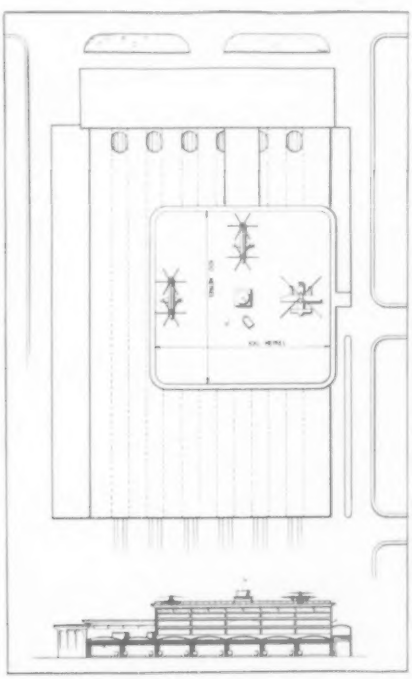
The discussions were based on a paper by Mr. M. G. K. Byrne, publicity manager of Blackburn, who made a vigorous and well-supported case for the development of a new airport and/or a heliport for Hull. Questions were answered by Mr. Byrne himself and by the four-man panel.

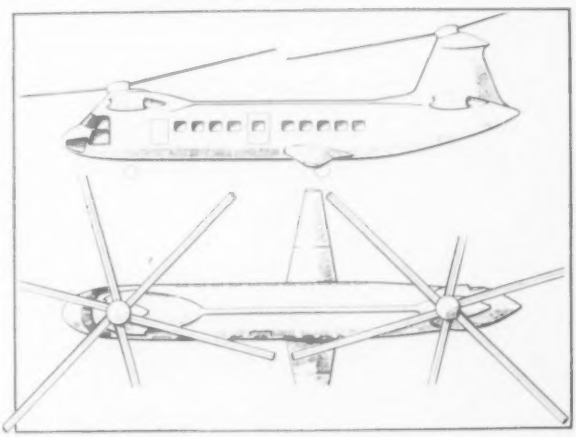
In their pre-discussion comments, or in answers to later questions, a number of useful points were made. For instance, Mr. Hedley Crabtree (aviation consultant) explained the system in Sweden whereby traffic was guaranteed for a year by the communities which wished to be served by the domestic airline; Mr. N. E. Rowe (Blackburn) dealt with technical questions about aircraft and hovercraft; Mr. Selby Lowndes (B.K.S. Air Transport) outlined some of the problems faced by the domestic carrier in this country; and Mr. H. A. Taylor (THE AEROPLANE AND ASTRONAUTICS) explained something of the present and future difficulties caused by the relatively poor economics of the airline helicopter.

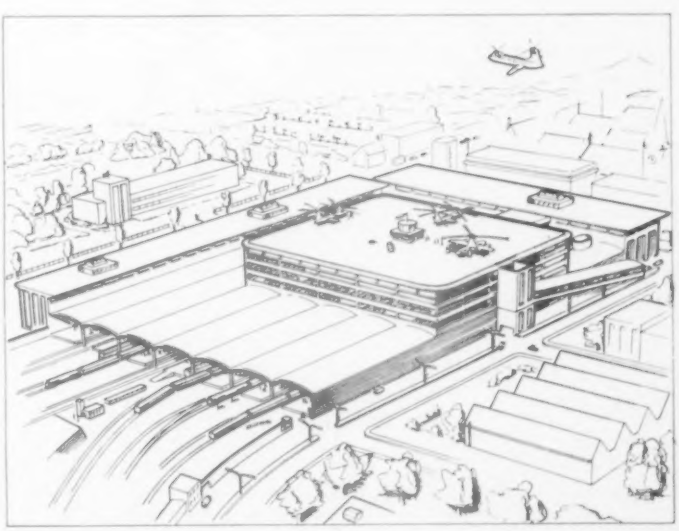
The various comments and answers—and many of the questions—helped to clarify the air transport situation as this can at present be seen, and the results made it very clear that this kind of panel game, based on a paper and/or on comments from specialists, can do a great deal to inform local opinion. In future meetings of this kind, at Hull or elsewhere, the panel could be briefed, for instance, to provide detailed information about airport and heliport costs and about the traffic potentialities of the community concerned.

Aerodrome Owners' Conference

SLIDES FROM THE HAFNER LECTURE

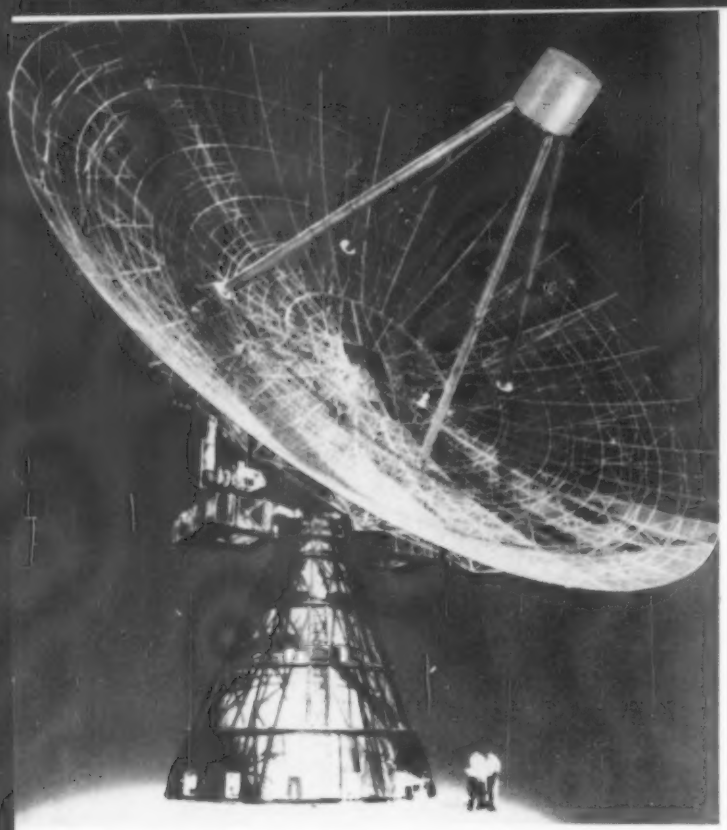






First reported in THE AEROPLANE AND ASTRONAUTICS on Oct. 7, details of the Westland (Bristol) 194—above, right—were disclosed by Mr. Raoul Hafner in a lecture in Paris on Sept. 27. Powered by four D.H. Gnome turbo-shaft engines, the B194 has a fuselage length of 77 ft.; rotor diameter of 55 ft. and wing span of 40 ft. His suggested layout for a heliport built above a railway station is shown above and right.

First of the BME



GIANT DISH.—This 84-ft.-diameter tracking radar is housed inside the radome seen on the right. It is designed to scan continuously for years without major overhaul.

FOR three weeks the United States and Canada have been able to receive radar warning of an ICBM attack over the North Polar regions. The radar base at Thule in Greenland became operational on Oct. 1. It is the first of three Ballistic Missile Early Warning System (BMEWS) bases which will cost £350 million in all.

BMEWS has been developed at high priority to give the United States and Canada at least 15 minutes' warning of any large-scale Russian attack by ICBMs. The first such base was set up at Thule because this site is approximately mid-way between many of the most important points in Russia and the United States; for example it is 2,730 naut. miles from Moscow and 2,185 naut. miles from New York. The detection radar at Thule has a range of approximately 3,000 miles and covers much of the Russian land mass.

When the initial studies for the system were made, it was considered that a single base at Thule would give sufficiently wide coverage, but it was soon decided that two additional bases would be needed if reliable warning was to be received of an ICBM attack across the Northern hemisphere. These additional bases are now being built at Clear, in Alaska, and Fylingdales Moor, in Yorkshire.

Clear will become operational next summer, and Fylingdales will follow suit in the summer of 1962. In conjunction with the Thule base they will provide complete detection coverage of missiles approaching Southern Canada, the United States and the United Kingdom from beyond the polar regions and the Eurasian land mass. Although ultimately the U.S. and Canada may be threatened by ultra-long-range missiles coming via the southern route, the main threat for several years is expected to be from shorter-range ICBMs which must pass over areas covered by BMEWS.

In future the introduction of Midas (Missile Defence Alarm System) missile-warning satellites will complement the ballistic missile early warning system. As a diagram on this page shows, BMEWS can detect ICBMs only after they have risen above the radar horizon. Each Midas satellite will carry infra-red equipment intended to detect the launching of ballistic missiles and their powered-flight phase. When this satellite system becomes operational the U.S.A.F. hopes that the minimum warning time of 15 min. now specified for BMEWS will be increased to 20 or 25 min.

Experience with Midas will probably show whether BMEWS needs to be extended to detect missiles approaching the U.S. and Canada from over the southern hemisphere. At present the U.S.A.F. has great faith in the potentialities of Midas. Gen. Thomas D. White, U.S.A.F. chief of staff, has said: "In May of this year the second Midas was successfully placed in orbit. A large amount of significant telemetered information was obtained on the first five orbits of this flight, prior to the satellite becoming unstable. This data, when correlated with the information obtained earlier from other tests, indicates conclusively that Midas will do its job."

Each BMEWS base is designed to gather information; to process and analyse it on the spot by means of solid-state computers; and to transmit it to North American Air Defense Command (NORAD) headquarters in Colorado Springs for evaluation. The location of the Fylingdales base in Britain and its equipment have been so chosen that it will give Britain a 4-min. warning of an IRBM attack as well as giving warning to the U.S. and Canada about oncoming missiles.

Background

In January, 1958, the Radio Corporation of America was chosen as prime contractor for BMEWS, with the Western Electric Co. as a separate prime contractor for the communications linking the detection bases with operational headquarters in the U.S. and Britain. A very large industrial team was set up to handle the programme; chief sub-contractors include the General Electric Co., which produces the detection radar equipment, Sylvania, for the data-processing equipment and the Goodyear Aircraft Co. for fabrication of the tracking radar antenna, pedestal and radome.

Some 2,900 companies have contributed to the programme and nearly 10,000 people are still working directly on BMEWS.

FOR YORKSHIRE TOO.—There will be three 140-ft.-diameter radomes like this at the Fylingdales base. Each will house an R.C.A. AN/FPS-49 tracking radar with a range of 3,000 miles. The British radomes will be painted pale blue.

The total estimated cost for setting up the system is £350 million.

On the military side BMEWS is primarily a U.S.A.F. programme under the management of Air Materiel Command. When bases are complete the operational responsibility for them is transferred to NORAD. The U.S. Army and Navy are also playing a big rôle in the construction programme, as is the R.C.A.F. In this country the R.A.F. is supervising the design and construction of base facilities at Fylingdales.

Equipment

BMEWS relies on two types of high-powered monopulse radar equipment. Each has a range of 3,000 miles—10 times that of DEW line radar equipment. The increase in range is achieved by using very high-powered transmitters and

WS Stations

The £350 million radar system is to give at least 15 minutes' warning of an ICBM attack on North America; by mid-1962 it is to give a four-minute warning of an IRBM attack on Britain

RADAR NET.—The position of the Clear and Thule BMEWS stations is shown in relation to the existing radar defences of North America.

exceedingly large reflectors which concentrate the transmitter energy into a narrower and more efficient beam. Power outputs are secret, but R.C.A. states that the Thule site alone requires many thousands of kilowatts, enough to light a city of 30,000 people.

The first type of equipment, now operational at Thule, is the General Electric AN/FPS-50. This has a fixed parabolic antenna which is 165 ft. high and 400 ft. across. It provides two stationary detection fans; they extend 3,000 miles over a sector at different elevation levels. High-power beams scan across the fans. If an ICBM is aimed at the U.S., it must pass through two of these fans as it rises above the radar horizon. Based on its detection in this way, computers at the BMEWS bases can determine its approximate impact point as well as the area from which it was launched.

The second type of equipment, not yet operational with BMEWS, is the R.C.A. AN/FPS 49 tracking radar. This is considerably more flexible in operation than the AN/FPS-50 detection radar. It can scan over various sectors at different elevation angles, giving fan coverage for detection; it also has circular scanning for acquisition of a missile which can then be tracked to give more accurate information on its trajectory than is possible with the large fixed detection radar.

This tracking radar has a large circular antenna. It is basically a much larger and longer range development of the radar used to track missiles fired down-range from Cape Canaveral. Its antenna is 84 ft. in diameter and the rotating assembly weighs about 200,000 lb. This radar is designed for 10 years of continuous scanning without major overhaul.

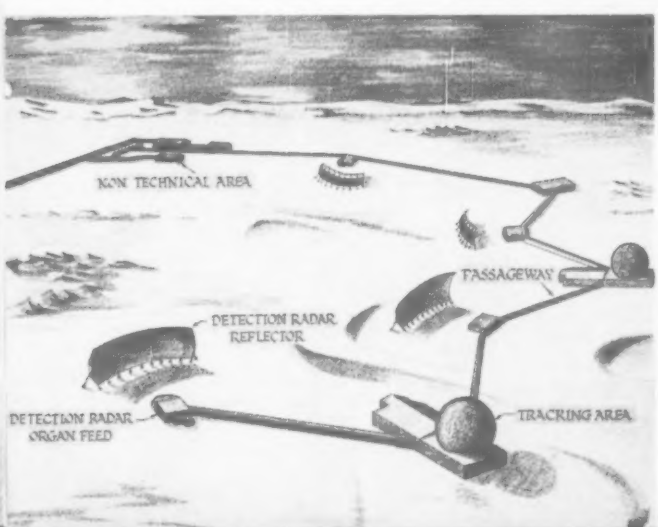
A prototype is under test by R.C.A. at Moorestown, New Jersey; it is housed in a giant dome-shaped structure. The radome, 140 ft. in diameter, has been designed to protect the antenna from arctic weather, including winds of up to 185 m.p.h.

Every effort has been made to ensure that both types of BMEWS radar equipment will be extremely reliable. Automatic check-out and monitoring is used to check continuously on vital parts of the radar sub-system; this is done using punched cards and targets simulated on magnetic tape. The radar equipment is designed on a module basis so that faulty parts can be rapidly replaced.

Computers play a vital rôle at the forward BMEWS bases. Each site has two solid-state computers, so that one can take over the work of the other during either scheduled or unscheduled shut-downs.

ICBM WARNING.—BMEWS radar extends far over Russia to give warning of a missile attack; at least 15 minutes' warning time is expected from the system.

The computers work out missile trajectories, and launch and impact points, from information supplied by the radar equipment. To prevent erroneous information being given they compare the trajectories with those of observed satellites and the characteristics of aurora and meteor trails. If several targets appear, they make decisions on those most suitable for coverage by the tracking radars. They also produce messages which give target data and the level of



THULE BASE.—Layout of the Thule BMEWS base is indicated in this diagram. The two tracking radars have not been installed, but the four detection radars are now operational.

confidence in this information; these are transmitted to the "zone-of-the-interior" display at Colorado Springs, NORAD headquarters.

It takes less than 10 sec. from the detection of a missile until the time a warning is displayed at NORAD and Strategic Air Command headquarters. Communication is by land and submarine cable, tropospheric-scatter radio and line-of-sight radio. There are at least two separate systems for communication from each forward base, and they are so designed that atmospheric conditions which could interfere with one system would not affect the other. Within the U.S. the land-line circuit avoids principal cities and other likely target areas.

At Colorado Springs the data from the BMEWS bases is decoded, evaluated in the light of other intelligence, and displayed. The level of the threat and the degree of confidence in the information is assessed and the decision is made as to whether an attack is under way.

Base Equipment

Not every forward base has the same radar equipment. Thule, which is now operational, has four detection radars which scan the central land mass of Russia. No tracking radars have yet been installed there, although the buildings for two trackers have been put up. As a result of a financial cut-back in the programme, tracking radars were not authorized for Thule or for Clear, but they seem likely to be restored at a later stage.

Thule is climatically the most difficult of the three forward bases, because it is 600 miles north of the Arctic Circle. Despite immensely difficult construction problems, it became operational on schedule and within its budgeted cost of £179 million.

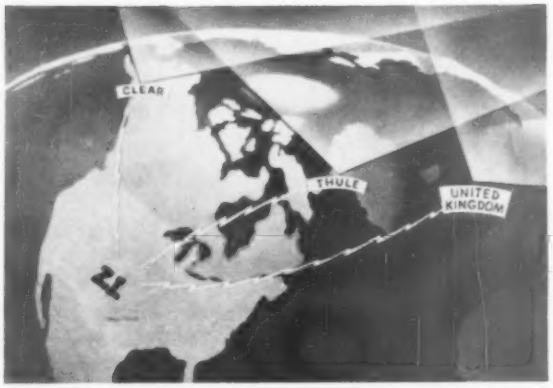
Construction of the Clear base in Alaska is on schedule; it has detection radars only—three as against Thule's four—but there is provision for two tracking radars to be installed. As already mentioned, Clear should be operational next summer; its cost will be £120 million.

The Fylingdales base in Yorkshire will have three tracking radars only; two will be used to detect ICBMs and IRBMs and the third to back these up and to track missiles. During a recent visit to R.C.A. in New Jersey it was implied that construction of this base was behind schedule; it is due to be operational in mid-1962.

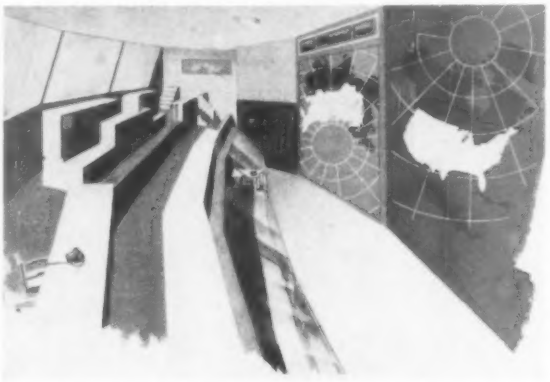
Apparently the location of this base was the subject of considerable discussion between the U.S. and Britain. Originally it was to have been in Scotland and to have given only warning of ICBM attack on North America. But following discussions it was decided that with a different site and equipment modification it could give Britain some warning—about 4 min.—of IRBM attack. Because of this the Fylingdales site was chosen.

A small range of hills in front of the radar equipment at Fylingdales is an advantage because it makes it more difficult for an enemy to bring powerful jamming equipment to bear on the site. For this reason no site directly overlooking the sea was chosen.

Britain has insisted that British citizens should be responsible for both construction and operation of the Fylingdales base. Its cost is scheduled to be £41 million, of which Britain will contribute about £8 million. Apparently the radar equipment for this base is well ahead of schedule; the construction rate of the base itself will decide when it becomes operational.



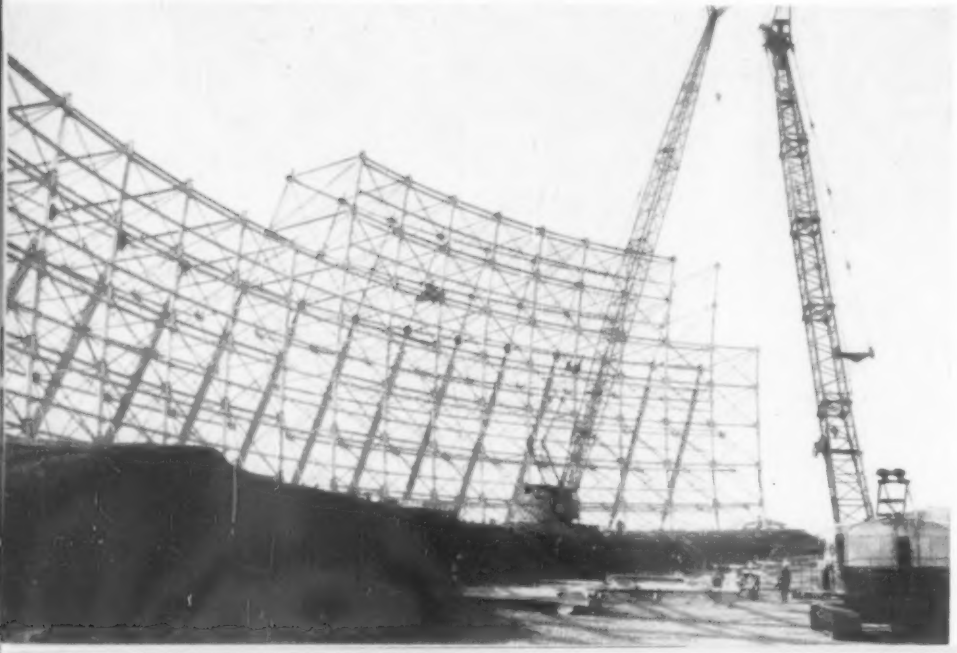
BMEWS BASES.—Radar coverage extends 3,000 miles from each of the three radar bases at Clear, Thule and Fylingdales Moor.



NORAD DISPLAY.—In the NORAD combat operations centre at Colorado Springs the BMEWS display indicates the impact area of enemy ICBMs, the number detected and the region from which they have been launched.

There is a clear feeling in the U.S. that its construction should be accelerated.

BMEWS has been called "the first operational space-age system." Although initially designed only to give warning of a massive ICBM attack, it can be adapted for satellite tracking, and this aspect will grow in importance as military satellites take to the skies. At the moment BMEWS only gives warning of missile attack, but in future it will probably be a vital link in an anti-missile defence system.—J. R. COWNIE.



FIXED ANTENNA.—"All BMEWS equipment has had to be engineered to king-size proportions," to quote a U.S.A.F. handout. Detection radars at Thule and Clear have fixed antennae of this type; each is 165 ft. high and 400 ft. long.

Twenty-four-hour Watch On Space

KEEPING track of every man-made object launched into orbit is a major task and one that is likely to grow even more onerous year by year. Precise information on the orbit and position of satellites is of interest to research scientists of course, but, with the increasing use of space for military purposes, the greatest significance is from the aspect of national security.

A national space surveillance network has been established in the United States under the direction of the Advanced Research Projects Agency. Its object is to provide means of detecting, tracking, cataloguing, and predicting the orbits of all space vehicles launched by the United States and other nations. The heart of this organization is the National Space Surveillance Control Center at Hanscom Field, Bedford, Mass.

Function of the Center is to collect data on space vehicles, compute their motions and distribute this information to a large number of government, military and scientific agencies. It is manned 24 hours a day by personnel from the U.S. Army, Navy and Air Force as well as by a number of civilian specialists.

A total of over 100 "sensor stations" provide data for the Control Center. They include the stations of U.S. Government agencies, co-operating foreign and domestic observatories, and various visual observing teams.

Data received at the Control Center are decoded, transcribed into a uniform format and stored on punched cards. After all the information has been screened, processed and analysed, the satellite orbits are computed by the IBM machines. The computer output tape goes directly into the sending teleprinters, providing almost instantaneous transmission of the calculations.

Orbital data, including predictions, are published in a regular bulletin sent to selected sensor stations and other interested agencies. Another special bulletin provides "look angles" to inform tracking stations with limited field-of-view equipment what area of sky to cover with their instruments during the passage of a satellite.

The Control Center maintains a computer "catalogue" of all space vehicles in orbit, so arranged that their position can be determined for any particular instant. The catalogue also charts the position of rocket boosters in orbit and other separated components which may accompany a satellite.

Sightings are communicated to this catalogue and the computer automatically compares these results with data on known space vehicles for identification. The new information is then used either to improve the satellite's orbit formula or to establish an equation for the new vehicle.

One of the Control Center's more dramatic features is a luminous map of the World upon which selected satellite positions can be displayed in the form of moving spots of light.

Orbital Observatory to be Ordered

A NEW satellite in the shape of an orbiting astronomical observatory to weigh about 3,200 lb. is the subject of a $23 million contract which NASA is negotiating with Grumman Aircraft Engineering Corporation. Containing some 1,000 lb. of experimental equipment, the "space platform" is intended to study cosmic phenomena, such as X-rays, ultra-violet and infra-red rays, which are cut off from the ground by the Earth's atmosphere. A preliminary description was given by Mr. Morton J. Stoller in London recently (THE AEROPLANE AND ASTRONAUTICS, Oct. 14, 1960, p. 541).

Grumman have proposed an eight-sided spacecraft 9.5 ft. high and 6.5 ft. in diameter. Its shell will be a standardized design containing stabilization, power and telemetry equipment into which one or more separate experiments can be installed for each mission. Astronomical equipment with reflecting mirrors up to 36 in. in diameter will be mounted in a central tube which runs the whole length of the satellite. Preliminary drawings show two large rectangular panels covered with solar cells extending from the sides of the vehicle; these are intended to supply 350 W. of power necessary to operate the internal equipment.

Two satellite observatories will be built under the present contract. NASA expects to launch the first from Cape Canaveral in late 1963 into a 500-mile circular orbit using the two-stage rocket Atlas-Agena B.

As we reported last week, the satellite will embody a stabilizing system capable of locking astronomical equipment on to the Sun, star or planet it is observing. Using its fine pointing control, the vehicle should be able to track a star with an accuracy of one-tenth of a second of arc (this is roughly equivalent to locking on to a football at a distance of 500 miles).

A satellite command system will receive ground signals to point and operate the satellite and its experimental equipment. It will verify the commands it receives and be capable of storing commands for execution up to two hours later. Confirmation of the direction in which the satellite is pointing will be obtained by means of a TV tube transmitting pictures to ground stations.

NASA's Minitrack network will be called upon to track signals from the satellite's radio beacon, command its experiments, and receive its telemetry. A memory device in the satellite will store at least 100,000 "bits" of information from the experiments for later read-out when the vehicle is passing over receiving stations. Large dish antennae will be erected at several established Minitrack stations for this purpose.

Supersonic Missile, Subsonic Launcher

THE Missileer programme of the U.S. Navy represents an interesting trend in defence against aircraft or stand-off bombs travelling at speeds up to Mach 4. The aim is to produce an air-to-air missile of great range and very high performance to be carried by a subsonic aircraft of relatively low performance which can "loiter" for lengthy periods a considerable distance from the ground target it is protecting. This approach is considered to give a much cheaper and more effective weapons system than is possible when combining a short-range air-to-air missile with a supersonic interceptor, as is current practice.

Intended to protect aircraft carriers against air attack, the subsonic Douglas Missileer aircraft will be powered by two Pratt & Whitney turbofans. It will "loiter" between 100 and 150 miles from the fleet, flying at about 35,000 ft. Each carrier-borne Missileer will carry six Eagle AAMs. The Eagle will be a Mach-4 missile capable of intercepting aircraft or stand-off bombs at distances up to 100 miles from the launch aircraft. Bendix is prime contractor for the missile, an artist's impression of which was published in our issue last week.

Study Group on Space Research

PROSPECTS for joint activity within Europe in upper air and space research moved a stage further recently when representatives of 10 nations met in London at the headquarters of the Royal Society. Some 40 scientists attended the meetings, which opened on Oct. 3 and closed on Oct. 6, the greatest number coming from the United Kingdom and France. Other countries represented were West Germany, Italy, Belgium, Sweden, Denmark, Norway, Holland, and Switzerland.

A primary object of the meeting—the third of its kind—was to consider what positive action might be taken by nations acting collectively in space research. One proposal, which appears likely to get active collaboration started at the earliest opportunity, is that the various nations should use one another's range facilities for sounding-rocket experiments. The advantages of this would be that measurements in the upper atmosphere could be obtained at different latitudes by the same basic equipment.

Already, in fact, British-built research instruments have been flown in the French Veronique rocket from Colomb Bechar in the Sahara. Arrangements have been made for the launching of instruments in the Canadian Black Brant sounding rocket at Fort Churchill, Manitoba.

In the near future, there are likely to be four ranges open to participants in a European research programme. These are Woomera (assuming a suitable agreement with the Australian authorities); Colomb Bechar (France); Sardinia (Italy), and a range within the Arctic Circle to be established jointly by Sweden and Norway. The advantages of a range in this part of the World is that it would permit research in the auroral zone.

The proposals adopted at the recent meeting are now to be presented to the respective governments and the committee members of the European Space Research Study Group are to meet again, probably in the New Year, to discuss the outcome.

Previous reports of the Study Group's meetings were given in THE AEROPLANE AND ASTRONAUTICS on Jly. 8, 1960, p. 31 and Sept. 2, 1960, p. 266.

Samos Fails

A PROTOTYPE Samos reconnaissance satellite failed to enter orbit on Oct. 11 when the second stage of the Atlas-Agena fell short of orbital velocity. Launched from the new Pacific Missile Range site at Point Arguello, California, the vehicle was intended to carry experimental photographic equipment into a polar orbit.

Like the Discoverer satellites—launched from Vandenberg A.F.B. by Thor-Agena—Samos was projected southwards along the Pacific Range and, had it been successful, would have "looked down" upon the entire surface of the rotating Earth. Since the experiment might be judged by the Russians as a repeat of the U-2 incident from outside the "territorial waters" of the atmosphere, political repercussions had been expected. It had been rumoured that President Eisenhower would offer the Samos reconnaissance system to the United Nations as a means of implementing his "open skies" proposal of some years ago.

The Fighting Services

Australian Replacements

ON his return to Australia last week after evaluating European and American aircraft that may be purchased by the R.A.A.F., Air Vice-Marshal V. E. Hancock, A.O.C., Operational Command, and Australian C.A.S. designate, said that the choice of a new fighter had been narrowed down to either the Dassault Mirage 3 or the Lockheed F-104 Starfighter. The Northrop N-156F Freedom Fighter had been rejected.

A. V. M. Hancock flew both the Mirage 3 and the F-104 at Mach 2 in test flights, and was impressed by their capabilities. He also flew the McDonnell F4H-1 Phantom 2, which the R.A.A.F. was considering as a possible replacement for its Canberras. A twin-engined, long-range, all-weather interceptor and attack bomber, the F4H-1 is expected to be in squadron service with the U.S. Navy later this year.

The Australian Government has also purchased 12 Lockheed P2V-7 Neptunes through the U.S. Navy. Deliveries are to be made between January and April, 1962. Earlier mark 5 Neptunes have been in service with the R.A.A.F. since 1951.

Queen's Colour

LAST week the Middle East Air Force became the first R.A.F. Command, either at home or overseas, to receive a Queen's Colour. It was presented on behalf of Her Majesty by H.R.H. The Duke of Gloucester during a parade at R.A.F. Akrotiri on Oct. 14.

Commanded by Wg. Cdr. C. W. McN. Newman, D.F.C., the parade included detachments from all stations in the Command. A flypast by Canberras of the M.E.A.F. Light Bomber Wing and Fighter Command Hunters was also staged during the ceremony at which Air Marshal Sir William MacDonald, the A.O.C.-in-C., replied to the Duke of Gloucester's address.

Belvedere Trials Unit

THREE pre-production Westland Belvedere transport helicopters were handed over to the R.A.F. on Oct. 13 at the Weston-super-Mare factory of the Bristol Helicopter Division of Westland Aircraft. The aircraft—XG 453, XG 454 and XG 456—were formally accepted by the commanding officer of the Belvedere Trials Unit, Sqn. Ldr. J. R. Dowling, M.B.E., D.F.C., A.F.C., from the deputy managing director of Westland Aircraft, Mr. D. C. Collins.

Based at R.A.F. Odiham, the Trials Unit is expected to complete its task within nine months and the first production Belvederes are due to be delivered to Commands overseas next summer. When in service with operational squadrons, the helicopter will be employed on duties similar to those at present undertaken by Whirlwinds.

Although the Trials Unit has enough personnel to fly the Belvedere with a captain, co-pilot and crew member it is regarded operationally as a single-pilot helicopter. In the transport rôle the Service Belvedere will carry up to 18 fully equipped troops and as a freighter will lift a maximum load of 6,000 lb., either internally or externally. For casualty evacuation it is to carry up to 18 patients and a medical attendant, or a maximum of 12 stretcher cases, two sitting patients and a medical attendant.

Powered by two 1,650 s.h.p. Napier N.Ga.2 Gazelles, the Belvedere is the Service's first turbine-engined, twin-rotor helicopter. It has a normal all-up weight of 18,500 lb. and a standard fuel capacity of 560 Imp. gallons which can be increased to 1,080 Imp. gallons with auxiliary tankage. In I.S.A. sea-level conditions and at the normal all-up weight it has a maximum cruising speed of 120 knots, a maximum rate of climb of 1,350 ft./min. and a service ceiling of 17,300 ft. The maximum range with standard tankage is 400 n. miles.

In a typical operation as a transport the Belvedere can lift 18 fully equipped troops to a point 70 n. miles from its base in 41 min., and return with 20% fuel.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. F. E. Croce to the Department of the Chief of the Air Staff; Wg. Cdr. T. R. N. Wheatley-Smith to the Department of the Air Member for Personnel; Wg. Cdr. W. W. T. Ritchie, O.B.E., A.F.C., Wg. Cdr. K. W. MacKenzie, D.F.C., A.F.C., and Wg. Cdr. J. L. Whitford (Wg. Cdr. Ritchie with acting rank of Gp. Capt.) to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. G. E. Dimmer to Headquarters for equipment duties.

Fighter Command: Gp. Capt. R. F. H. Clerke, D.F.C., M.A., to R.A.F. Waterbeach to command; Sqn. Ldr. P. D. C. Street, D.S.C., A.F.C., to R.A.F. West Raynham to command the Flying Wing, with acting rank of Wg. Cdr.

Transport Command: Wg. Cdr. J. L. Lendrem, O.B.E., to Headquarters for technical planning duties; Wg. Cdr. D. L. Norris-Smith, O.B.E., to Headquarters as Deputy Senior Personnel Staff Officer.

Flying Training Command: Wg. Cdr. R. E. Glover, D.F.C., to R.A.F. Valley to command the Administrative Wing.

Technical Training Command: Gp. Capt. A. H. Dormer to No. 1 Radio School, Locking, as Senior Training Officer; Gp. Capt. G. G. Robinson to Headquarters, No. 22 Group, as Senior Officer, Administration; Wg. Cdr. J. A. Smith to Headquarters, Provost and Security Services; Sqn. Ldr. W. A. Russell to No. 12 School of Technical Training, Melksham, as Senior Education Officer, with acting rank of Wg. Cdr.

More Service News

Goldfish Reunion.—The 9th Goldfish Club reunion dinner will be held on October 29. Further details may be obtained from the Hon. Secretary, A. A. L. Davies, 11 Melbourne Road, Teddington, Middlesex. Club members are also gathering at 10.30 hrs. on Sunday, Nov. 13, at Westminster Pier for a service on board a launch on the Thames adjacent to the R.A.F. Memorial.

Maintenance Command.—Air Marshal Sir Douglas Jackman, A.O.C.-in-C., Maintenance Command, is to lay the foundation stone of the Command's new headquarters at Amport, Andover, on Oct. 26. The new building will be the first especially designed for a Command headquarters since 1945.

M.E.A.F. Rescue Services.—The M.E.A.F. mountain rescue and para-medical teams in Cyprus are to be reinforced by an R.A.F. Regiment parachute team. At present training at R.A.F. Akrotiri, the Regiment team is commanded by Sqn. Ldr. A. A. Stewart, C.O. of No. 27 Light Anti-aircraft Squadron.

BELVEDERES IN SERVICE.—As recorded above, Sqn. Ldr. J. R. Dowling, O.C. of the Belvedere Trials Unit at Odiham, took over the first three R.A.F. Belvedere H.C.1s from Mr. D. C. Collins, deputy managing director of Westland Aircraft, at Weston-super-Mare on Oct. 13. On the right is Air Cdre. C. M. Wight-Boycott, Director of Logistics (Forecasting and Planning) at the Air Ministry.

Photograph copyright "The Aeroplane and Astronautics"

The F.A.I. in the Rocket Era

IT has taken the 53rd Annual Conference of the Fédération Aéronautique Internationale to get the Americans and the Russians to co-operate in a rocket operation or, at least, to agree on a new aspect of rocketry—the setting up of official records. The two countries' delegations got together in a room outside the Conference Hall in Barcelona, and drafted a set of rules which the assembly subsequently agreed.

The new rules classify records in manned rockets for duration and altitude with and without orbit, also for the greatest weight or mass carried to an altitude of 100 km. or more. A pertinent qualification calls for the record-breaker to claim the record personally, not posthumously—he must come back alive.

JACQUELINE COCHRAN
Retiring President

JACQUES ALLEZ
New President

Another altivolant classification was for altitude sustained by an aircraft for 15-25 km. or 90 min.—it need make only one run during which it may gain height; the speed when leaving the course must be equal to or more than the speed of entry and the altitude for record purposes will be that at which the course is entered.

The bonhomie between the two delegations and indeed among all the delegates of the 32 nations represented was a welcome relief after the shouting match in the United Nations, although even in the tranquil dignity of the historic Hall of the Throne, where Columbus was received by Queen Isabella after his first exploratory American voyage, some umbrage was evident when the Aero Club of the Democratic Republic of Germany applied for F.A.I. membership. In the end, Jackie Cochran, completing her two-year term as president—and handling the meeting as capably as she handles aeroplanes—came up with the bright suggestion that the East German club be allowed in as an associate member, a half-a-loaf course which was eventually accepted.

The Royal Aero Club of Spain and the city of Barcelona were generous hosts, for the second time, to the F.A.I. delegates at this, the 53rd Annual Conference, held through Oct. 3-8. An air rally and a flying display were also held in connection with the conference, both getting substantial international support.

Miss Jacqueline Cochran's successor is M. Jacques Allez, for many years a leading representative of private and sporting French aviation. Harold Gillman is the permanent director-general and M. Jean Blèriot the treasurer. The British delegation was S. Kenneth Davies, Col. R. L. Preston, vice-chairman and secretary-general respectively, of the R.Ae.C., R. L. Ninnes, a Bristol Siddeley director, and our old friend Capt. Kenelm Bartlett, F.A.I. president before Miss Cochran.

As the conference made clear, the F.A.I.'s biggest concern is the welfare of the private and sporting flyer of aircraft, sailplanes, helicopters and balloons, with an eye on parachutists and aeromodellers. Through their world-wide membership they aim to "develop aeronautics and stimulate airmindedness." They negotiate with authorities, especially ICAO, to get obstacles removed and sensible standards adopted, ease of passage facilitated, international acceptance of other countries' airworthiness standards and private pilots' licences, and unification of air space regulations. On the latter point, some success has rewarded the Private Aviation Committee's campaign to raise VFR minima from 700 ft. to 1,000 ft. Other subjects were radio frequencies, landing fees and the reduction of documentation.

Several new F.A.I. awards were announced — the U.S.S.R. have given the P. N. Nesterov Challenge Cup for the best individual performance at the Federation's aerobatic championships; from Mexico the Lascurain y Ossio Gold Medal is for future award to an outstanding engineer or scientist; and the F.A.I.'s Montgolfier Diploma and Medal for balloon pilots was awarded in this, its first year, to seven recipients, but only one will be awarded annually hereafter.

Awards for 1959 were: F.A.I. GOLD MEDAL to Pierre Satre, designer of the S.E.210 Caravelle airliner; DE LA VAULX MEDALS to the following record-breakers: Gueorgui Mossolov (2,388 km./h.), Gerard Muselli (1,771 km./h., closed circuit), Maj. J. W. Rogers, U.S.A.F. (2,455 km./h.), Gen. H. Moore, U.S.A.F. (1,878 km./h., closed circuit); LILIENTHAL MEDAL to R. E. Schreder, U.S.A., for establishing three World speed records for Class D-1 sailplanes in an aircraft he designed and built himself. Among the recipients of PAUL TISSANDIER DIPLOMAS were R. E. Hardingham, chief executive, A.R.B.; L. C. Nash and H. Best-Devereux.

Brazil's invitation to hold next year's conference in their new capital Brasilia, was accepted.

Vice-presidents elected for the new term of office were: Dr. W. Muri (Switzerland), Senior vice-president; Gen. C. Sillevaerts (Belgium), Col. R. L. Preston (Great Britain), Gen. N. Soderberg (Sweden), J. Gaisvacher (Austria), M. Obregon (Colombia), K. Grepl (Czechoslovakia), Capt. J. Foltmann (Denmark), M. Duperier (France), C. Francke (Germany), C. Kolf (Holland), Dr. M. Zerbinatti (Italy), Gen. E. Gallarza (Spain). Miss J. Cochran (U.S.A.), V. Kokkinaki (U.S.S.R.), S. Sakota (Yugoslavia). The first four above-named, with M. Jacques Allez, make up the board.—WREN.

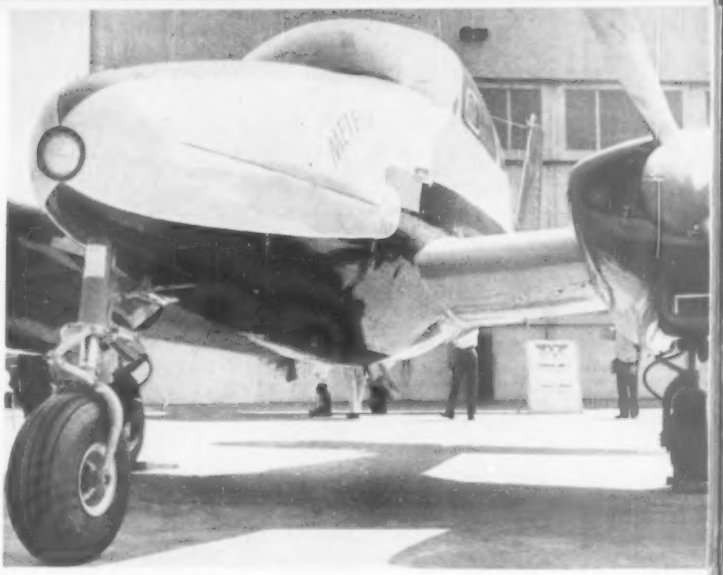
Above, left to right, Wolfgang von Gronau, Jacques Allez, Capt. K. J. Bartlett and "Chuck" Yeager.

Right, general view of the F.A.I. Annual Conference in the Hall of the Throne, Barcelona. In foreground, U.S.A. delegation, behind is that from Great Britain.

Photographs by "Wren"

Business Aircraft at Los Angeles

Photographic report by
Howard Levy and Henry Arteff



Above and left, a completely new five-seat executive twin on show at Los Angeles was the Saturn Meteor II, which in prototype form is powered by two 180 b.h.p. Lycoming engines. Production aircraft are to have the new 204 b.h.p. fuel-injected Lycomings, and will be sold for $44,000, equipped. The Meteor makes extensive use of glass fibre for nose, canopy, fin, tailplane, elevator, cowling, tip tank and door sections, and cruises at 199 m.p.h.

Above, attracting much attention was the turbine-powered Bell 204B helicopter, commercial version of the record-breaking HU-1, and seating up to eight people.

THE National Business Aircraft Association held their 13th annual meeting and forum at Los Angeles, California, Sept. 20-22. This non-profit organization is composed of hundreds of business and industrial companies who own their own aircraft and operate them throughout the World in the furtherance of their company's business. Business flying is indeed a "big business" for it accounts for nearly 6,000,000 hours flown annually in comparison with the scheduled airlines' 4,300,000 flight hours each year, according to NBAA figures.

Top business pilots, 217 of them, whose companies are members of the NBAA have flown a total of 215,106,812 miles or more than 8,638 times around the World, without a single accident.

During the meeting, 58 of the companies were honoured for completing 1,000,000 miles or more of accident-free business flying operations. One company—Goodyear Tire and Rubber Co., Akron, Ohio—has recorded more than 6,000,000 flying miles without accident; four companies have completed more than 5,000,000 miles each; four other companies have logged

Two tricycle developments of the well-tried Beech Model 18 on show were (above), the Volpar-geared conversion, with forward-retracting nosewheel and fully enclosed undercarriage, and (left) the more radical Rausch Star. The latter has a rearward folding nosewheel, three-bladed props and a deeper fuselage.

Above, a civil conversion of the North American T-28B trainer, the PacAero Nomad Mk. 1 is powered by a 1,425 b.h.p. Wright Cyclone radial engine and has a maximum speed of 307 knots, with a gross weight of 8,300 lb.

over 4,000,000 miles each; 12 companies have qualified for awards with more than 3,000,000 miles each and 14 companies have completed over 2,000,000 miles each—all accident free.

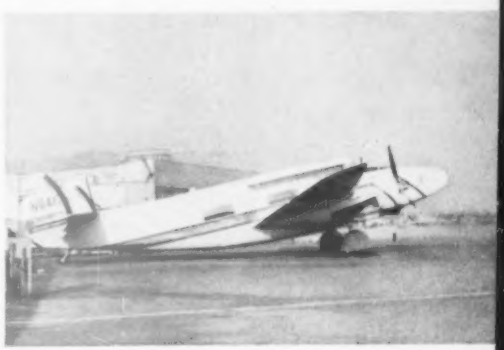
During the recent annual meeting, a number of forums were held, including:— F.A.A.'s Proposed Maintenance/Overhaul Standards for Business Aircraft; Flight Characteristics of Modern Aircraft; Aeromedical Aspects of Aviation Safety; Users Report: Helicopters for Business; Small Turbine Engines for the Business Fleet.

The leading aviation manufacturers and suppliers of aircraft, aircraft parts, engines, accessories, radios, instruments, etc., displayed their products in a static display at the Ambassadors Hotel in town.

Static and flight demonstrations of America's business aircraft fleet ranging from conventional single and multi-engined aircraft through turboprop and jet transports were held at Lockheed Air Terminal, Burbank. New transport conversions, new interiors, helicopters, and JATO demonstrations completed the array of "Business on the Wing."

Among the aircraft were:— Cessna and Beech complete line; Fairchild F-27; Grumman Gulfstream; Aero Commanders; Howard Aero; Pacific-Airmotive turboprop Convair conversion; L. B. Smith and On-Mark B-26 conversions; Volpar Tri-Beech 18 conversion, N.A.A. Sabreliner, etc.

NBAA's 14th annual meeting and forum will be held Sept. 26-28, 1961, in Tulsa, Oklahoma.



Above, a general view of the business aircraft on display at the Lockheed Air Terminal. Right, one of many Lockheed 18 conversions is the Howard Aero 250, with extended fuselage and "picture" windows.

Popular as a basis for high-speed executive conversions, the Douglas B-26 was shown in several pressurized forms at the NBAA meeting. Left, is the On-Mark Marksman, seating up to eight passengers with baggage, and cruising at 350 m.p.h., while below it is the Lockheed Air Service Super 26. The photograph below shows the 10-seat L. B. Smith Tempo II, with built-in air stairs fore and aft.

Below, converted from the Convair L-13 surplus liaison aircraft, the Servicair CV-105 Loadmaster now has a 450 b.h.p. R985 Wasp engine and carries a 1,400 lb. payload. Take-off and landing runs are less than 400 ft.

Flying the Beechcraft Debonair

by John Fricker

BEECH can claim several records for longevity in light aircraft designs. The Model 18, popularly known as the "Twin Beech," first flew at the beginning of 1937, and has been in continuous production ever since, which is surely an unparalleled performance. The Model 35 Bonanza is equally distinguished among post-War designs, having first flown in 1946. Some 6,500 examples have been delivered up to the present time.

Beechcraft aeroplanes are the "Cadillacs" (or in view of the new Continental engine tie-up, perhaps one should say Rolls-Royce) of their class, being built and finished to a correspondingly high standard. At $25,300 in the U.S., the Bonanza, for example, costs $2,850 more than the Cessna 210, and $5,500 above the Piper Comanche 250. Apart from its luxurious finish, however, the extra cost of the Bonanza buys a considerable gain in performance as well as an unusually rugged structure, stressed to ultimates of +6.6 and −2.6 *g*, at max. gross of 2,950 lb.

This strength is retained in the Model 35-33 Debonair which was developed last year as an economy version of the sleek and long-selling Bonanza, to compete in the slightly lower price bracket occupied by Piper and Cessna. Both in performance and $19,995 price, which in the U.K. is about £9,450, duty paid, the Debonair corresponds fairly closely to the Cessna 210 and Comanche 250, although it achieves its 180 m.p.h. cruising speed on less horse-power. It has the same Continental IO-470 flat-six engine as the Bonanza, but with a lower compression ratio, for an output of 225 instead of 250 b.h.p.

More cost is saved in the simplified interior, which still retains a very high standard of finish, but lacks, for example, the additional rear windows of the Bonanza. Except for the replacement of the low-drag and 14 lb. lighter Vee-tail of that aircraft by a conventional empennage, and the absence of the extended Hoerner wing-tips, the Debonair airframe is otherwise much the same as the Bonanza. These slight variations account for a difference of more than £2,000 on the delivered price of the two types, which are being handled in this country by Short Brothers of Belfast and co-distributors Aircraft Associates, Ltd.

It was from Queen's Island that I was able to sample the Irish-registered demonstrator, EI-ALI, on a recent raw and gusty day at Short's airfield. As U.K. distributors for the Beech company, Short Brothers are in the unique position among sales agents of being able to guarantee the brochure figures after extensive flight testing by their well-equipped organization.

When flying the Debonair, it was a question of beating the arrival of a front, whose imminence was proclaimed by a searching wind gusting 40 degrees at 15-17 knots across the single large runway which points out into the Loch. With staff pilot John Formby standing by to show me round the cockpit, there was time for only a quick appraising glance at the Debonair's gleaming all-metal skin and businesslike new tail before settling into the left-hand seat via the single long starboard door. This has a positive double-locking system to resist suction forces in flight, and provides easy access to both front and rear seats.

Cabin comfort is to a very high standard, and I noticed that EI-ALI was fitted with the third side windows over the 270 lb. baggage compartment as an optional extra. These make the cabin wonderfully unclaustrophobic, and the all-round visibility is exceptionally good. None of the windows open, although there is a useful hinged d.v. panel in the front corner of the forward side-screen. Arm-rests and adjustable seats complete an agreeable atmosphere of luxury.

It was some years since I flew a Bonanza (THE AEROPLANE, April 5, 1957) but although my recollection of the control and instrument layout was imprecise, I did notice some of the more obvious changes in the Debonair. The standard swing-over handwheel is retained, although the Debonair is normally without the aileron trim knob on the shaft end, and EI-ALI has the optional dual rudder pedals. The row of slightly confusing "piano-key" switches on the Bonanza have disappeared in favour of toggle selectors, with pop-out circuit breakers on the starboard side.

In standard form, the Debonair has only basic flight instruments, but EI-ALI is equipped with the alternative full panel, arranged in a rather straggling fashion because of the location of nav. radio on the left-hand side. Below this, in the demonstrator, are simple but effective comm. radio and a "Bird-dog" DF set.

Engine instruments are on the starboard side, with a central group of gauges including those for the main and auxiliary fuel. Normal capacity is 25 U.S. gal. in each wing, with an additional 10 gal. per side if required, making a total of 58 Imp. gal.

Around the central control column shaft are grouped flap and undercarriage warning lights, flap position being indicated, as

(*Continued on page 569*)

Location of the Narco Omnigator set on the port side of the Debonair panel results in a slightly unorthodox layout of the flight instruments. These are provided in only basic form in the standard Debonair. In this photograph, the control wheel is swung over to the second pilot's position.

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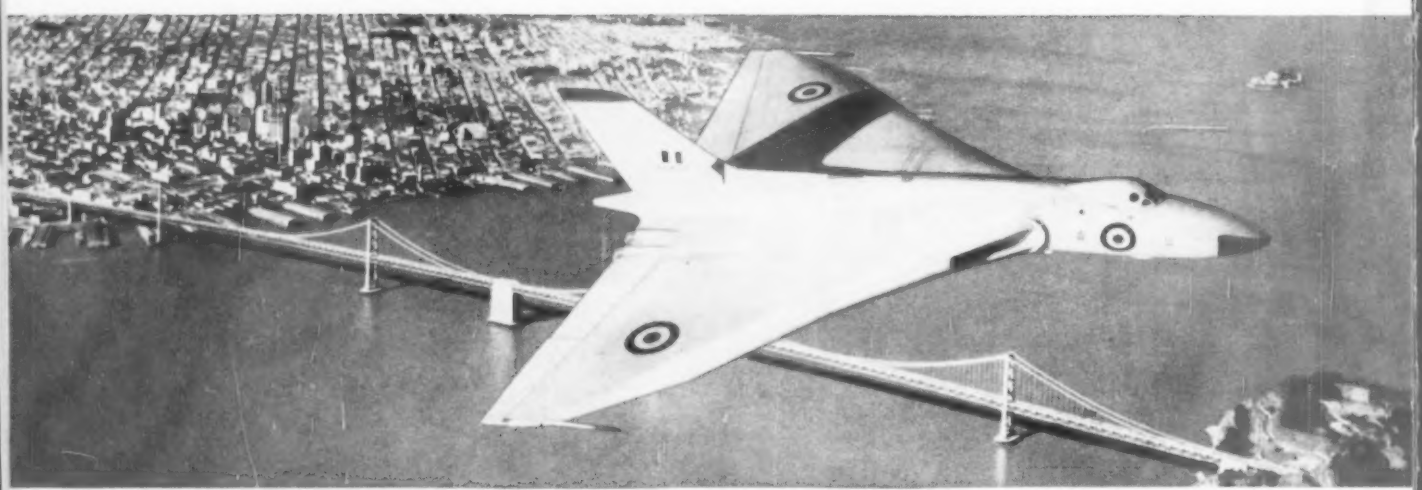

A Vulcan of 617 Squadron over San Francisco

Wing Commander Guy Gibson, V.C.

Just before 1 a.m., May 17, 1943, Wing Commander Guy Gibson radioed back to his base the one word "Nigger". This was the name of his well-loved dog, killed only a few hours before by a car; it was also the code-word indicating that the Möhne dam had been breached. An hour later the code-word "Dinghy" told the same story about the Eder dam. These two hammer-blows at German industry marked the brilliant debut of 617 Squadron, formed from hand-picked crews only two months before specifically for this operation. It was an audacious mission calling for delicate judgment and high courage, qualities which earned 617 a Squadron Standard of Battle Honours,—the youngest squadron ever to receive one.

Today's member of 617 Squadron flies in a bomber which has the striking power of the whole of last war's Bomber Command. He has all the skill and nicety of judgment of his predecessors but these are now applied to the split-second accuracy of modern flying instead of to the calculated risks of war. The appearance of the Squadron has changed as radically as its function. From Lancasters to Vulcans. From a vital part of a war machine to an integral part of a war deterrent. From bombing runs over Europe to flights quartering the globe. The one thing which has not changed—will never change—is the spirit of 617 Squadron.

On a Lone Ranger flight to Nairobi and back, a Vulcan of 617 Squadron will cover nearly 10,000 miles—and never be more than a few seconds out on its E.T.A. It gives some idea of the level of 617's flying when this performance is regarded as nothing out of the ordinary, especially if the crew is classified as Select Star. A crew—pilot, co-pilot, navigator-plotter, navigator-radar and air electronics officer—starts as Unclassified and, as it improves, moves up to Combat, Select or—the very top flight—Select Star. The members always fly together as a team and the idea behind the Lone Ranger trips, and the Western Ranger trips to North America, is to familiarise them with the Vulcan, with new routes—usually without aids from the ground—new airfields and, perhaps most important, with each other.

By the time a crew has become Select Star every member can do his own job under any conditions and he also knows exactly how everybody else works. On a bombing exercise they get their aircraft over target dead on time and simulate an attack with an accuracy more than adequate for any type of weapon. These modern exercises are complicated affairs and a whole day is spent de-briefing, when any mistakes are thoroughly analysed.

This is the bread-and-butter work of 617. The jam comes in such special missions as the Las Vegas trip to put the Vulcan through its paces at the World Congress of Flight and the highly successful round-the-world flight several Vulcans of 617 did in 1959.

This year 617 was one of three squadrons chosen to appear at Farnborough in a demonstration of Bomber Command's latest "scramble" techniques.

617 never flies as a complete squadron; this may sound remarkable but a part of the squadron must always be ready on the ground whilst other aircraft of the squadron are away on exercises. But it isn't all work for members of 617. There is a fine atmosphere about their station at Scampton, Lincolnshire. There is the best sort of rivalry between the crews and this becomes more serious on the local golf course. Golf is the big thing at the moment and you are more likely to hear about cutting down a handicap than the flying time from Goose Bay.

It's a good life in the R.A.F. today.

TODAY'S TOP JOB IS THE R.A.F.

The Royal Air Force

37-year-old Wing Commander L. G. Bastard assumed command of 617 this year. A really experienced pilot, he has flown 22 types of aircraft from the smallest to the largest in both piston-engines and jets—Hurricanes to Halifaxes, Hunters to Vulcans. He joined up in 1941 at 18; was commissioned at 20 and did 25 operations in Halifaxes in the war; 1946, food-drops in Dakotas,—Burma and India; 1948, 300 sorties in Berlin air-lift; 1954, West African Royal Tour in Canberras; 1955, anti-terrorist operations in Malaya.

29-year-old Squadron Leader R. A. Streatfeild is the captain of a Vulcan. Went direct from Eton to Cranwell and had experience on Vampires (he was an instructor) and Canberras (target-marking duties) before joining 617 in 1958. His trips include Las Vegas and Karachi, Western Ranger to Omaha, Lone Rangers to Nairobi and Oslo. He is unmarried and lives on the station where he is Station Careers Officer and Deputy Mess President. Plays cricket, squash, golf and has a taste in classical music ranging from Bach to Britten.

25-year-old Flying Officer R. J. Swift was educated at Devizes Grammar School and joined the R.A.F. in 1956. He came to 617 Squadron in 1959 as an Air Electronics Officer, a new type of commission for the specialists who deal with the vast amount of electrical and electronic equipment a modern bomber carries. He has been on a Western Ranger flight to Goose Bay, Labrador and also—the highlight of his flying career to date—on the round-the-world trip in 1959. Unmarried, his leisure is pretty active—sailing his own dinghy, pot-holing, driving go-carts.

26-year-old Flight Lieutenant R. J. Turner did his navigator training at Prince Edward Island, Canada. First posting was Search and Rescue with H.Q. 19 Group, then to Canberra squadrons—102 in Germany, 35 in the U.K. on detachments to Malta. Joined 617 in 1958 and has already done plenty of globe-trotting—Germany, Malaya, Southern Rhodesia—plus the round-the-world trip in 1959. He and his family—wife, daughter of 3½, son of 3 months—live in married quarters. Car rallies, golf and photography account for most of his leisure.

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(*Continued from page 568*)

in the Bonanza, by lines at 10 degree intervals on the top surface of the port side. Elevator trim is via a commendably logical wheel under the port panel, but its indicator is virtually invisible to the pilot, being immediately below the massive control column. The arm on which the control wheel is mounted has a high and low position, according to one's preference, but I gathered I was not alone among many other pilots in wanting a non-existent intermediate location.

Throttle and Hartzell airscrew pitch plungers have the usual vernier knobs, which are not, however, provided on the mixture control. This is more than usually important with the fuel-injected Continental, which has the now-familiar large-sized fuel pressure and mixture gauge to facilitate the precise metering of petrol according to airfield altitude and percentage power.

Like all its tricycle-geared compatriots, the Debonair taxies easily with the aid of its steerable nosewheel, through rudder pedal movement. The nosewheel steers through 17° each side and castors up to 29° each way with a jab of toe brake.

The single-disc hydraulic brakes are very effective and require rather less foot pressure to operate than do the rudder pedals for steering. The 10 ft./sec. oleos are fairly long-stroke for a well-cushioned ride, and a twist of the throttle vernier gives ample power adjustment for taxi-ing on the small wheels.

With slight nose-up trim for our load of two-up and full fuel, and no flap on the long runway, I cautiously opened the throttle to full power of 29-in. Hg. and 2,600 r.p.m. Fortunately, the very strong cross-wind from starboard opposed the natural torque reaction of Continental- and Lycoming-powered aircraft which require right rudder for take-off and climb, and the Debonair proved remarkably stable during the rapid acceleration. The sensitivity and positive nature of the nosewheel steering give excellent directional control, with very small rudder movements.

Slight aft pressure on the handwheel at about 60 m.p.h. resulted in a clean unstick some 10 m.p.h. later. The ground run was no more than about 400 yd. Yawing into the cross-wind and battling masterfully with the heavy gusts, the Debonair indicated over 1,000 ft./min. in a cruise-climb at about 120 m.p.h., after the electrically actuated undercarriage had been retracted with a slight nose-up trim change.

The best rate of climb is achieved at 104 m.p.h., and the best angle at about 80 m.p.h., with power maintained at max. r.p.m. and 26-in. Hg. One of the sacrifices to economy in the Debonair is a rudder trimmer, but the load on the right foot involves no great hardships during the rapid climb unless you are going to the best cruise height of 11,000 ft.

I settled for 4,000 ft. over Belfast Lough, reducing power to 22.2-in. Hg. and 2,300 r.p.m. and adjusting the mixture accordingly to indicate the appropriate 60% on the fuel pressure gauge. The elevator trim wheel proved very sensitive and high geared on winding it forward to level out, and the airspeed settled down to indicate about 153 m.p.h. This trues out to about 163 m.p.h. and gives a range, using less than 9 Imp. gal./hr., with full auxiliary fuel, of well over 1,000 miles. Alternatively, it is possible to cruise at 75% power and 7,000 ft., to return 185 m.p.h. T.A.S. and still achieve a range of more than 900 miles.

My most immediate impression on first getting airborne in the Debonair was of its resistance to pronounced turbulence. There seems little doubt that stability has improved, compared with the Bonanza, since the replacement of the Vee-tail. This is particularly apparent at lower speeds, when I seem to remember the Bonanza having a Messenger-type wallow. Its absence makes the Debonair very pleasant to fly.

The ailerons, as they should be but seldom are, proved light, crisp and responsive, with the elevator rather heavier—deliberately so, no doubt, to keep inexperienced pilots out of trouble in so slippery an aeroplane—and the rudder in between, in effort. The A.S.I., which is usefully calibrated in both knots and statute miles, is red-lined at 225 m.p.h., thus giving a good safety margin, and the undercarriage is stressed for emergency extension up to 200 m.p.h. as an air brake.

From a 10 m.p.h. speed increase, the Debonair returned to level flight after three longish oscillations, but directional stability was more positive. Laterally, the Debonair was just about neutral, and coupled with the potent controls this stability pattern added up to a highly manœuvrable and easily flown machine. Trim changes are small with speed and power. Pilot comfort is heightened by the low level of noise and vibration.

In my first quarter of an hour in the Debonair I was beginning to get quite attached to it, and its low-speed handling did not modify that impression. The aircraft has rather more of a stall than some American types with relatively limited elevator travel or effectiveness, but it is completely innocuous. Clean, it loses speed slowly as the nose is trimmed up after reducing power, until a brief buffet and a flickering of the stall warning light is added to the background noise of the undercarriage horn some 5 m.p.h. before the straight breakaway at 68 m.p.h. I.A.S. The "all-down" stall, at 58 m.p.h., is accompanied by a port wing drop, but some lateral control is available throughout.

It is soon apparent, when flying the Debonair, that despite its advanced performance, it is certainly no more difficult to fly than any of its contemporaries. After the usual trim change check when overshooting from the approach configuration, which demands a moderately heavy push force on the wheel until a flick of the elevator trimmer relieves the load, I motored EI-ALI round the chimney-pots of Belfast in a right-hand circuit towards the runway and its starboard cross-wind.

Not the best of combinations, and the fierce turbulence did not help to maintain an accurate approach speed. By using a flapless approach, however, to minimize drift; keeping plenty of speed in hand, with about 90 m.p.h. on the clock, and kicking the responsive rudder during an inevitably pump-handling flare-out while judging the feel of the elevators, I achieved a fortuitously smooth touch-down for which the Debonair deserved all the credit.

It was not the sort of day that tempts one to go back and do a few more circuits just for fun, but in such conditions I felt that the Debonair had accounted itself as well as any aircraft I had ever flown. From what I had seen of flap effect in flight, it seemed possible that the Debonair might, like several of its contemporaries, be slightly underflapped by European standards for small airfields, but I may be doing this very efficient aeroplane an injustice in that respect. It is apparently possible to bring it in as slowly as 72 m.p.h., with 30 deg. of flap and power, and touch-down at 65 m.p.h., with a nil-wind landing distance of less than 400 yd.

Having flown both the Bonanza and the Debonair, it seems to me that very little has been sacrificed to produce the cheaper machine, although many people will doubtless continue to demand the additional refinements, performance and capacity of the Vee-tailed version. In the first seven months of this year, 169 Debonairs were sold compared with 201 Bonanzas.

Leading Particulars

DIMENSIONS.—Span, 32 ft. 10 in.; length, 25 ft. 6 in.; height, 8 ft. 3 in.; wing area, 177.6 sq. ft.

WEIGHTS.—Empty, 1,730 lb.; available for passengers, baggage and equipment with 41 Imp. gal. fuel, 857 lb.; useful load, 1,170 lb.; max. gross, 2,900 lb.

PERFORMANCE.—Max. speed, 195 m.p.h.; cruising speed, 75% power at 7,000 ft., 185 m.p.h.; 65% power at 11,000 ft., 180 m.p.h.; 45% power at 10,000 ft., 143 m.p.h.; initial climb, 1,010 ft./min.; service ceiling, 19,800 ft.; take-off distance to 50 ft., 1,160 ft.; landing distance from 50 ft., 1,150 ft.; cruising range, at 45% power, normal, 845 miles; with auxiliary fuel, 1,170 miles.

Unlike the aircraft in the heading photograph, which is of the aircraft flown for this article, this American-registered Debonair is in standard form, without the small rear windows in the cabin.

Personal Flying

MORE details are now available of the Australian light aircraft ordered by the Auckland Aero Club which were mentioned in our previous issue. The four four-seaters involved in the order from Victa Consolidated Industries at Milperra, N.S.W., are Victa R-2s, powered by the 180 b.h.p. Lycoming engine, designed to cruise at 180 m.p.h., and take off in 540 ft. The prototype R-2 has not yet flown, although it is due to do so in the next two or three weeks, and the type has been ordered off the drawing board by the New Zealand club.

Mr. Henry Millicer, who designed the other Victa aircraft, the three-seat Air Tourer, has now resigned his position as chief aerodynamicist at the Government Aircraft Factory, to become chief designer at V.C.I. The Air Tourer prototype, the design of which won the Royal Aero Club light aircraft competition in 1953, has a wooden spar and mainplanes, but these will be metal in the production machines. With a 95 b.h.p. Continental, the Air Tourer is fully aerobatic, and is therefore suitable for both training and touring.

• • •

Australia is also importing a number of foreign aircraft for private and executive use, and in recent weeks, five Czech-built machines have been sold to Australian buyers. Six more will be flown or shipped to Sydney before the end of the year. Most popular is the twin-engined Super Aero 45 or 145.

Following the easing of import restrictions, dealers expect sales of at least 200 aircraft this year, worth nearly £A1,500,000.

• • •

Floatplane flying has been something of a lost art in the U.K. since the War, and no aircraft capable of marine operation are currently airworthy on the British Register. Interest in this very different branch of flying has not completely disappeared, however, and a move is afoot within the Royal Aero Club to form a United Kingdom Seaplane Club.

Present plans are to hire a suitable aircraft, probably a Piper Super Cub, for a guaranteed annual utilization of perhaps 300 hours per year, with an overall cost for members of something like £7 an hour. Probable location of the club will be Southampton Water or the Solent, where suitable facilities are available. An honorary instructor will have to be appointed, and many other points of detail arranged.

About 100 guaranteed members will be necessary before such a club can be launched, and a meeting to discuss this probability is being organized by Air Cdre. G. J. G. Paul, Secretary-General of the Air League, at Londonderry House, 19 Park Lane, W.1, on Friday, November 18, at 17.00 hrs. Mr. Lankester Parker, Britain's best-known marine pilot, will preside and an agenda has been outlined for the formation of the club and its committee. Further details are obtainable from Air Cdre. Paul on request.

• • •

Dermot Boyle, son of the former Chief of Air Staff of the R.A.F. was one of three British undergraduates who recently returned from a 14,000-mile trip to Nepal and back to the U.K. in an Auster Alpine. All three were former R.A.F. pilots who undertook the five-week trip to study the refugee problem in Nepal first-hand. Leader of the expedition was David Lomax, of Brasenose, Oxford, and the third member was John Brown, of Christ's, Cambridge.

The Alpine was the first of its type to land at Katmandu, and could it be the first to be arrested for landing at one of the desert airstrips alongside the oil pipeline in Iraq? The party was under house arrest there for two days, before resuming their journey. On their return to Cambridge, the three men received a letter of congratulation from the Secretary of State for Air, Mr. George Ward.

• • •

In the first eight months of this year, no fewer than 140 powered aircraft and 142 sailplanes were involved in accidents in West Germany, and 36 people were killed. Of these, 20 were crew members and 16 passengers, and a further 48 crew and 22 passengers received injuries. Thirty-two aircraft were completely destroyed, and the remainder damaged.

With the exception of two accidents, involving one death and two injuries, all these casualties occurred in non-business and sporting flying.

Gliding Notes

by Dr. A. E. Slater

DERBYSHIRE and Lancashire Gliding Club is celebrating its 25th anniversary with a dinner in Buxton on Dec. 9. "The Sailplane and Glider" for 1935 contains no evidence of the exact date of the club's foundation, which was brought about by the fusion of the Derby Gliding Club with the Gliding Section of the Manchester Branch of the Royal Aeronautical Society; but it was announced in September that year, that the two groups were jointly organizing an at-home the following Easter, and in November that they were under the management of one committee and were about to form a company.

The Derby Club had its first flying meeting on Sept. 15, 1934, at Cocking Tor, near Ashover, whither Gerry Smith, Louis Slater and R. G. Robertson brought the Golden Wren which they had recently built themselves.

But spokesmen for the Manchester group keep insisting that they started flying in 1929, in advance of the general gliding revival of 1930. I have never believed this, and now the truth can be read in the *Journal* of the R.Ae.S. for last July on page 441, where it is stated that the Society's Manchester Branch "formed a Gliding Section in March 1930, and a primary glider was built by members at the Newton Heath works of A. V. Roe and Co. Ltd."

The Derbyshire and Lancashire Club is about to try out a "Watch System" of two-seater training to ensure pupils getting their flights at week-ends without an inordinately long wait. Pupils have a choice of putting themselves down for the "red watch" on Saturday afternoon, "white watch" on Sunday morning or "blue watch" on Sunday afternoon. How about a "dog watch" before breakfast?

The Club's Christmas party is on Dec. 17.

* * *

THERMALS should be detectable by radar, if P. C. M. de Belatini, of Standard Telecommunication Laboratories, at Enfield, is correct in holding them responsible for refracting high-frequency radio waves to and from points below the visual horizon. When radar secrets were released, just after the War, this refraction, which revealed low-lying objects across the Channel, was attributed to a strong humidity gradient over the sea, i.e., the air was very much damper close to the water than a few feet higher up.

Mr. de Belatini, in a letter to *Nature*, Vol. 184, p. 1558, makes no mention of this explanation, but it doesn't matter because thermals are most frequent over land, though he shows no evidence of knowing this either. But he does appear to have proved satisfactorily that a thermal acts as a "weak lens" for radio waves, though he calls it a "toroid" (which should please Betsy Woodward).

One gathers that he attributes the refraction to the thermal being warmer than its surroundings. However, the fact that it is damper should also cause refraction, but in the opposite direction. Mr. de Balatini's diagram shows that he has taken no account of this, in spite of the fact that he actually exaggerates the humidity by saying that thermals are saturated, which they are not unless they are full of cloud. So far as I can see, radio waves could be reflected downwards by the top of the thermal because of its humidity, and by the bottom of the thermal because of its warmth.

Perhaps, by the time the author has published the more extended paper he has promised, all this will have sorted itself out and we shall know definitely whether invisible thermals can be detected with short-wave radio.

Sound waves should also be refracted by thermals, and about 14 years ago the Cambridge Club proposed doing some research on this if Government support was forthcoming. But it wasn't.

* * *

KENT Gliding Club's newsletter mentions a five-hour flight by Philippa Buckley, who started with an hour over the hill at Lympne, then contacted thermals and travelled along a cloud street to a better ridge at Wye, where she stayed till 20.30 hr. She is the sixth club pilot to complete the Silver "C."

The club now includes two subsidiary groups from Woolwich Polytechnic and Silver City Airways.

* * *

A NEW version of the famous Ka-6, which won the OSTIV prize in the Standard Class, has been produced in a more simplified form for amateur construction by the designer, Rudolf Kaiser, and the Poppenhausen factory. Called the Ka-8b, with the same 15-m. span, it weighs 189.2 kg. empty (417 lb.), has a minimum sink of 0.67 m./sec. at 60 k.p.h. (37.3 m.p.h.) and best gliding angle of 1 in 27 at 73 k.p.h. (45.4 m.p.h.).

* * *

A new club is being formed at Bourne, Lincs. Secretary's address: 19 Willoughby Road, Bourne.

Correspondence

From Air Cdre. Sir Vernon Brown, Kt., C.B., O.B.E., M.A., F.R.Ae.S., R.A.F. (Ret.).

Backward-facing Seats

IN the Editorial of your issue of Mar. 5, 1954, you quoted from a paper I had read at the Royal Society of Arts to the effect that ". . . I am certain that if seats were constructed to withstand 20 g and if, in addition, they faced backwards and were provided with adequate head, back and leg protection, the mortality cum injury figure would in the case of survivable accidents be reduced to an almost negligible quantity. . . ."

Later, in a letter of mine which you published about the Munich crash, I said it would be helpful to know how many of the 22 survivors were seated in the backward-facing seats of the Elizabethan. When Mr. Gresham Cooke asked this question in the House he was given no answer; I now have the temerity to suggest that it was 22.

The accident to a R.A.F. Valetta which crashed on Jan. 20, 1954, shortly after take-off was another good example of passenger survival in like circumstances. In that case, one of the five crew members was killed and three were seriously injured, but of the eight passengers, which included two children aged four and five respectively, five were unhurt and three suffered minor injuries. They were all sitting in backward-facing seats.

Many other cases could of course be cited, the latest of which is the accident to the Hermes at Southend on Oct. 9.

St. James's, London, S.W.1. VERNON BROWN.

These Historic Films

WITH reference to the TV programme "The Flying Years," it seems a pity that with the obvious increase and interest in aviation history and early aircraft, the B.B.C. with their research facilities cannot present a more accurate narrative to back an interesting set of clippings from the past. This may have been due to wrong captions being applied in the original versions, which failing I find from my own research work to be very common. Such a programme should be checked for its historical accuracy and not just for its presentation.

To collect pictures of several Wright machines under the generic title of "Flying" is misleading considering the speed of development of those days. A variant of a particular machine might have been a great technical advance, though only a couple of months may have separated it from its predecessor. When one considers that sometimes about a hundred of the very early machines were built, as for example Farmans, and that every owner or pilot had his own ideas, great care must be taken before putting a name to a particular aeroplane or variant.

Leyton, E.10. T. W. SHREEDE.

Metric All-through

REFERRING to Mr. Shapiro's article last week, surely M. Paul Morain's figures for disc loading, p. 490, should, surely, be 10-20 kg./sq.m. (m for metre). The "in." was presumably an error either in transcription or in type setting.

Warton, Lancs. J. F. FOSS.

[Our correspondent is quite correct. The error was not the author's but occurred in transcription, so ours is the error. —ED.]

From Air Vice-Marshal Sir John W. Cordingley, K.C.B., C.B.E., R.A.F. (Ret.)

Farthings

YOU were kind enough to print my appeal to your readers to send unwanted farthings, now obsolete in our currency, to help this Fund. Your readers may now like to know that already we have received over 23,000 farthings. Bearing in mind the high cost of postage and stationery, and since many were sent anonymously, I should like to take this, my only opportunity, to thank all who have turned out their cupboards in this helpful way.

Not all your readers sent farthings. Silver threepenny bits and other coins helped to produce a total of nearly £50. One postal order was accompanied solely by the message "With love." A reader who had no farthings sent £1, representing 960 farthings, following it up later with a cheque for a further £4. I was particularly touched by his regard for the R.A.F. since he described himself as "an old horse soldier of World War I."

Incidentally, among coins received were several minted in the reigns of George II, George III and George IV.

Every little helps and the farthings will soon be doing good work for relief of distress among serving and ex-Service members of the R.A.F., W.R.A.F., their families and dependants.

JOHN W. CORDINGLEY,
Controller, R.A.F. Benevolent Fund.

Groundabout

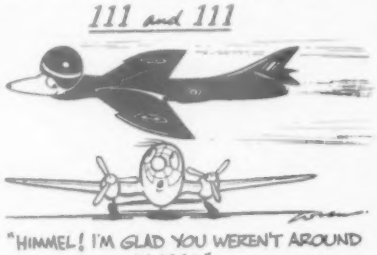
Barcelona

Couldn't resist it—sunshine and Cinzano, flying and the F.A.I., and the last chance to see Treble-One's glorious show. So from their Wattisham base in a 99 Sqn. Britannia's sensible seating—backward-facing with adjustable tilt, more than most airlines can offer. Charming American wife of A.V.M. Alick Foord-Kelcey, A.O.C. 11 Gp., flew with us, the A.V.M. sharing the Hunter T.7 with Sqn. Ldr. Peter Latham. Ground crew member says that to mark the occasion they are playing with *clean* packs of cards during the trip and calling each other *nice* names.

✱ Politics and aviation, such a pity. French and Spanish air authorities, met., control, don't seem to take kindly to one another—also no French participation in the display. The Russians, of course, never come, probably no aerobatic team. I suppose they don't need to show the flag or boost recruiting—but they miss some good parties.

✱ Aircraft spotters would have loved this show—as well as Spanish-built Hispano Saeta jet trainer, AC-12 helicopter, CASA Azor transport and Dornier 27, there are the Skyblazers, USN F3H Demons showing deck landing technique and F8U Crusaders in level supersonic flight at 300 ft.; Italian F-84s; DC-3s dropping parachutists; six kinds of prop. airliners, plus DC-8, assorted private types, and 111's final finale, after Flt. Lt. Ross Colwill in a reserve Hunter had perfectly coincided a sonic boom with the team's entry.

✱ One very nostalgic scene: A Heinkel 111, Fieseler Storch and Bucker Jungmeister looking like a picture in *The Aeroplane Spotter* of 1940.



✱ Treble-One pilot's description of Señor Aresti's flick rolls in a Jungmeister: "Looks more like a horizontal spin."

✱ During a break in the FAI meeting I asked "Chuck" Yeager when he first took to aviation. "Didn't take the least interest until, at 16, I had my first close-up of an aircraft, a small personal ship which had crashed in some local woods. I took one look at the wreck and said 'Aviation is for me.'" Well, it's a good story.

✱ The Italian team's aerobatic presentation was surprisingly comprehensible and unchallenging, considering it was led by a Captain Picasso.

✱ The show, held between 10.45 and 13.00 (morning fiesta, afternoon siesta), had a cold front predicted for it. Here's the scene at midday:

by Lorenz

Industry Record

Hydrant Refuelling

Zwicky, Ltd., is currently supplying the Jetstream hydrant dispenser to the Shell International Petroleum Co., Ltd. Mounted on a Bedford chassis, this unit is designed to fuel Boeing 707s, DC-8s and other large transport aircraft.

Fuel enters the dispenser through a 4-in. bore three-section intake boom, and then passes through two 6-gallon Zwicky-B.P. shock alleviators and a restrictor pressure controller. The circuit then flows through a filter/water separator unit to a meter and sight flow glass before being divided into two circuits.

The first of these consists of a 4-in. butterfly valve, a variable venturi and a hose reel fitted with 30 ft. of 2½-, 3- or 4-in. collapsible hose. The second also has a butterfly valve and a variable venturi, together with a Zwicky relaxation tank. This second circuit then divides into two similar lines consisting of a 3-in. double-swivel elbow, 11 ft. of 2½-in.-bore hose, and a 45°-swivel elbow and self-sealing coupling.

Through the first circuit (30 ft. x 2½-in. hose) the fuelling rate against a hose end pressure of 50 p.s.i. is 150 i.g.p.m. The fuelling rate through the second circuit (two x 11 ft. x 2½-in. hose) against a similar end pressure is 250 i.p.g.m. per hose. The overall pressure loss from intake boom to hose end at 500 i.g.p.m. is stated to be 30 p.s.i.

The Jetstream hydrant dispenser which is being supplied to Shell International by Zwicky, Ltd.

Material Testing

In 1947 the engineering company of Tiltman Langley, Ltd., was established at Redhill Aerodrome to undertake research work into the basic strengths of materials for R.A.E. Farnborough. The results of this work have been used in the structural stressing of both military and civil aircraft now in operational service.

Since that date the research and testing capacities of the company have been expanded. Its 20,000-lb. Macklow-Smith tension-compression machine and a N.P.L.-type axial fatigue machine are currently employed on M.o.A. research work into the strengths of joints.

A.R.B. approval has been granted to cover the test house, in respect of the physical testing of ferrous and non-ferrous materials. The company also holds A.I.D. test house part 3 approval for the examination of welded, spot-welded, and brazed joints.

Other equipment includes a machine of the company's own design for determining the torsional shear strengths of tubes and bars; Vickers hardness and izod machines; optical extensometers; high precision gauges; balances; metallurgical camera-microscope, and a dark room. Furnaces and baths for the heat treatment of ferrous and non-ferrous materials are also in use. Testing can be done at a wide range of temperatures whether sub-normal or elevated, on the tension-compression, fatigue and izod machines.

Other projects undertaken by the company have included the fatigue testing of springs and joints, wear of piston rings and cylinders, strain gauging, and the design and manufacture of test rigs for complex mechanisms and drives.

Liquid Oxygen Development

An improved insulation technique which reduces losses due to evaporation in liquid oxygen (LOX) storage and dispensing vessels has been announced by British Oxygen Aviation Services. The result of a joint undertaking by British Oxygen Research and Development Ltd., and British Oxygen Engineering, Ltd., the new technique is, for example, expected to achieve a loss rate on a 75-litre LOX dispenser of only 1 or 2% per day.

Work is in hand to apply the technique to a 25-litre and other liquid oxygen converters designed for larger aircraft, which it is anticipated will halve the present evaporation losses. The new method, which involves the use of a vacuum, can be employed in a number of ways depending on the size and type of storage vessel. It essentially consists of greatly reducing heat transfer by radiation without significantly increasing the heat influx by solid conduction.

Aviation Calendar

Oct. 25

London Airport Central.—Institute of Transport West Middlesex Group lecture, "Economics of the Peak in Air Travel," by Garret Fitzgerald, in the Conference Room, 3rd Floor, Control Tower, at 18.30 hrs.

Glasgow.—R.Ae.S. Branch lecture, "Evolution of Airlines," by A. Williams, at the Engineering Building, University of Glasgow, at 19.30 hrs.

Oct. 26

Bristol.—British Institution of Radio Engineers South-Western section lecture, "Radio Aids for Automatic Landing Developed by the Blind Landing Experimental Unit," by J. S. Shayler, at School of Management Studies, Unity Street, at 19.00 hrs.

London.—Kronfeld Club talk by Murray Amor of Rhodesia, at the Basement, 74 Eccleston Square, S.W.1.

London.—Institute of Navigation A.G.M., Presidential Address "The Philosophy of Navigation Today," by Wg. Cdr. E. W. Anderson, at the Royal Geographical Society, 1 Kensington Gore, S.W.7, at 15.00 hrs.

Oct. 31

Amesbury, Wilts.—R.Ae.S. Boscombe Down Branch lecture, "Background for Space Travel," by A. F. Collins, in the Lecture Hall, A. and A.E.E., at 17.30 hrs.

London.—Institute of Transport Metropolitan Section lecture, "The Operation of the Air Ferry," by W. G. Franklin, at 80 Portland Place, W.1, at 18.00 hrs.

Nov. 2

London.—British Institution of Radio Engineers Radar Group discussion, "Radar—Pulse or C.W.?", at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, at 18.30 hrs.

Nov. 3

Hayes.—R.Ae.S. L.A.P. Branch lecture, "Helicopters," by Peter Brooks, in the Westland Fairey Division Lecture Hall, at 18.15 hrs.

London.—Kronfeld Club painting exhibition and competition, at the Basement, 74 Eccleston Square, S.W.1, until Nov. 9.

Company Notices

NEW COMPANIES

Atherton Aircraft, Ltd. (670,180).—Private co. Reg. Sept. 16. Cap. £5,000 in £1 shs. Directors: Lionel Atherton and Sheelagh M. J. Atherton, both of The Lodge, Sunhaven, Ranmore Common, Dorking, Surrey. Reg. off.: The Lodge, Sunhaven, Ranmore Common, Dorking, Surrey.

Executive Air Transport, Ltd. (670,302).—Private co. Reg. Sept. 19. Cap. £500 in 5s. shs. Offer aircraft for hire or charter with or without aircrews and for attendant facilities. Directors: John W. Mole, "Shelsley" Fern Hill Heath, Worcester; Eric A. Ashton, 20 St. Pauls Close, Hounslow West, Middlesex; John J. Muldoon, 54 Walford Drive, Sheldon, Birmingham. Sec.: Thomas A. Herbert. Reg. off.: 20 St. Pauls Close, Hounslow West, Middx.

New Patents

APPLICATIONS ACCEPTED

854,905.—**Sperry Rand Corporation.**—"Flight aid systems for aircraft."—Jan. 1, 1957. (Jan. 3, 1956.) (Divided out of 854,904.)

854,815.—**Love, J.**—"Aircraft."—Apr. 14, 1959. (Apr. 14, 1958.)

854,859.—**English Electric Co., Ltd.**—"Aircraft wings incorporating a power installation for propulsion."—Feb. 14, 1958. (Feb. 21, 1957.)

854,601.—**Irving Air Chute of Great Britain, Ltd.**—"Quick-connector parachute packs."—Mar. 25, 1959. (Apr. 3, 1958.)

854,768.—**Martin-Baker Aircraft Co., Ltd.**, and **Martin, J.**—"Ejection seats for aircraft."—Mar. 25, 1958. (Mar. 29, 1957.) (Cognate application 7832/58, Mar. 29, 1957.) (Divided out of 854,769.) (Addition to 724,955.)

854,769.—**Martin, J.**—"Ejection seats for aircraft."—Mar. 25, 1958. (Mar. 29, 1957.)

854,906.—**Sperry Rand Corporation.**—"Flight aid systems for rotary wing aircraft."—Jan. 1, 1957. (Jan. 3, 1956.) (Divided out of 854,904.)

Printed specifications of the above will be available on Nov. 23, 1960, and the opposition period will expire on Feb. 23, 1961.

Personal Notices

BIRTHS

Bainbridge.—On Oct. 1, at R.A.F. Hospital, Ely, to Audrey (*née* Innes), wife of Wg. Cdr. R. T. Bainbridge—a daughter.

Ewens.—On Oct. 6, at Hartismere Hospital, Eye, Suffolk, to June (*née* Hindmarsh), wife of Flt. Lt. A. V. Ewens—a daughter.

Field.—On Sept. 27, at Royal Bucks Hospital, Aylesbury, to Mary, wife of Sqn. Ldr. J. L. Field—a son.

Furniss.—On Oct. 2, at R.A.F. Hospital, Wegberg, to Denise, wife of Sqn. Ldr. P. Furniss, D.F.C.—a daughter.

Fountain.—On Sept. 23, to Sqn. Ldr. and Mrs. Fountain—a son.

Haven.—On Oct. 7, at Stamford and Rutland General Hospital, Lincs, to Emma (*née* Doolan), wife of Flt. Lt. R. C. Haven—a son.

Hawkins.—On Sept. 30, at the Military Hospital, Tidworth, Hampshire, to Yvonne (*née* Clark), wife of Flt. Lt. J. A. Hawkins (deceased)—a son.

Hurry.—On Oct 2, at R.A.F. Maternity Hospital, Wegberg, Germany, to Edwina Marie, wife of Wg. Cdr. J. Hurry—a son.

Kennedy.—On Oct. 1, to Beryl (*née* Chapman), wife of Flt. Lt. E. Kennedy—a son.

King.—On Sept. 28, to Margaret, wife of Flt. Lt. C. M. King—a daughter.

Lucie-Smith.—On Oct. 4, at St. Teresa's Hospital, Wimbledon, to Rosalie (*née* Eastwood), wife of Wg. Cdr. H. J. Lucie-Smith—a son.

Matthews.—On Oct. 8, at R.A.F. Hospital, Cosford, Staffs, to June (*née* Reynolds), wife of Sqn. Ldr. D. Matthews—a son.

Ogilvie.—On Oct. 3, at R.A.F. Hospital, Wegberg, B.F.P.O. 40, to Rosemary, wife of Sqn. Ldr. R. Ogilvie, A.F.C.—a daughter.

Stankowski.—On Oct. 1, at R.A.F. Hospital, Ely, to Delia, wife of Flt. Lt. Z. A. Stankowski—a daughter.

DEATHS

Bruce-Gardner.—On Oct. 1, Sir Charles Bruce-Gardner.

Thorne.—On Oct. 5, A.V.M. Walter Thorne, C.B., C.B.E.

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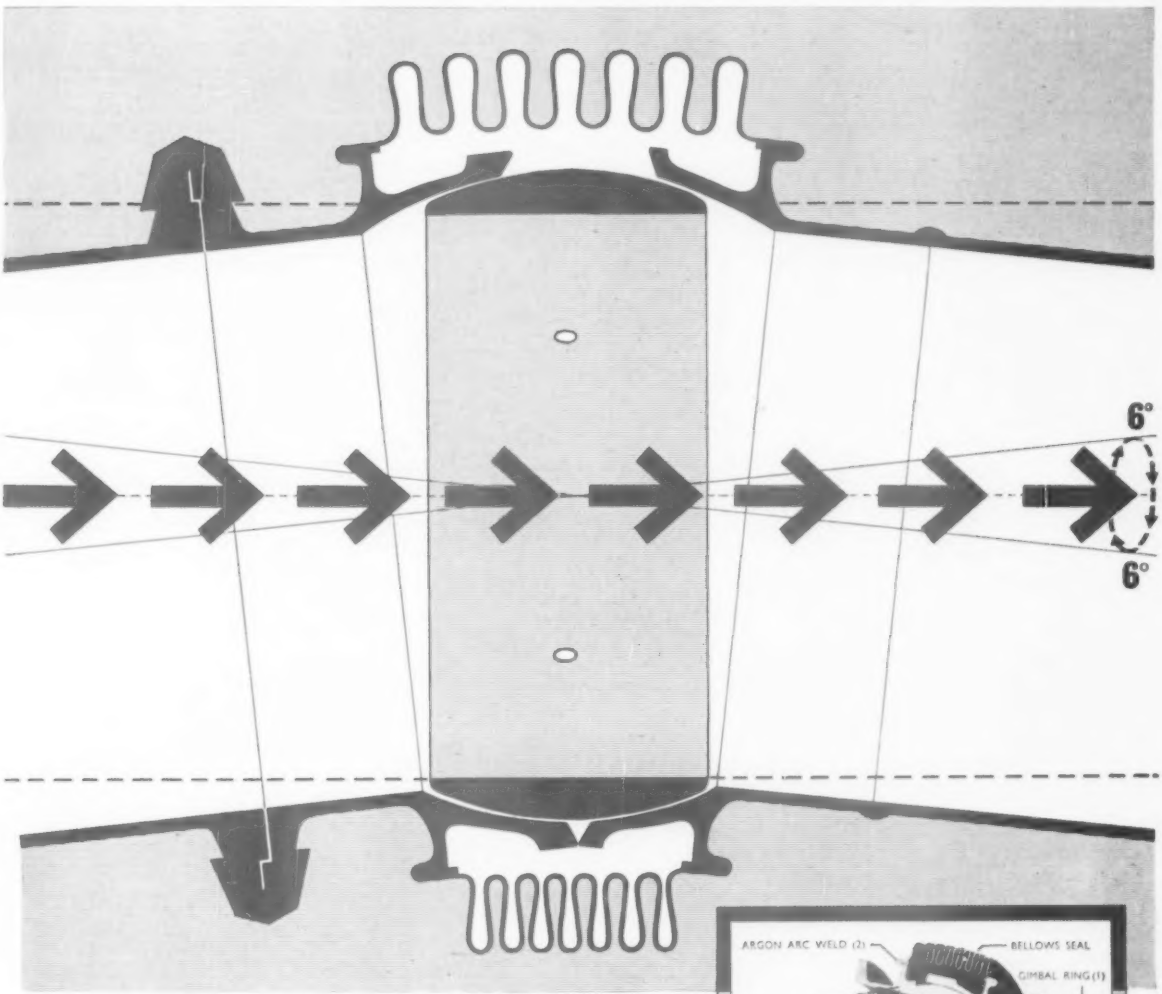

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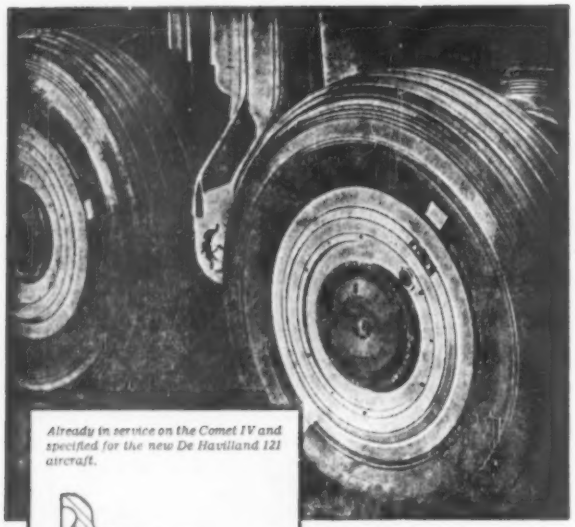
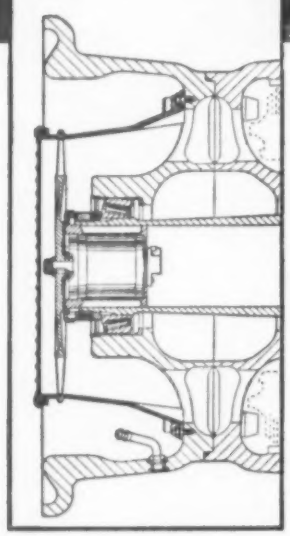


Already in service on the Comet IV and specified for the new De Havilland 121 aircraft.



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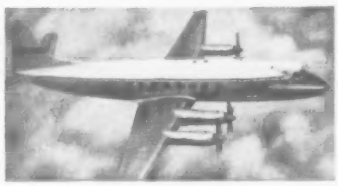

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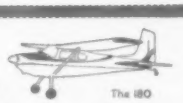

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NOTICES

AIR TRANSPORT ADVISORY COUNCIL.

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM SILVER CITY AIRWAYS, LTD., OF 62 BROMPTON ROAD, LONDON, S.W.3, for the following Vehicle Ferry Services initially with Bristol 170 aircraft, and later also with Breguet 763 aircraft for the carriage of vehicles and associated passengers, incidental passengers and supplementary freight at an initial frequency of six return flights daily on each service, increasing later in accordance with traffic demand for seven years from March 1, 1961:—

APPLICATION NO. 4502 on the route Leeds/Bradford-Le Touquet and/or Calais and/or Cherbourg.

APPLICATION NO. 4503 on the route Blackpool and/or Manchester and/or Liverpool-Le Touquet and/or Calais and/or Cherbourg.

APPLICATION NO. 4504 on the route Glasgow and/or Edinburgh-Le Touquet and/or Calais and/or Cherbourg.

APPLICATION NO. 4505 on the route Newcastle-Le Touquet and/or Calais and/or Cherbourg.

APPLICATION NO. 4506 between Newcastle and Amsterdam.

FROM OVERSEAS AVIATION (C.I.), LTD., OF 6 YORK STREET, ST. HELIER, JERSEY, C.I., for the following seasonal Normal Scheduled Services unless otherwise stated, with Argonaut aircraft for the carriage of passengers and supplementary freight at an initial frequency of three return flights weekly on each service increasing later in accordance with traffic demand, from May to October each year for seven years from the date of approval:—

APPLICATION NO. 4508 between London (Gatwick) and Stavanger.

APPLICATION NO. 4509 on the route London (Gatwick) - Hamburg - Copenhagen - Gothenburg - Stavanger-Manchester.

APPLICATION NO. 4510 on the route Liverpool-Birmingham-Stavanger-Gothenburg.

APPLICATION NO. 4511 to be operated throughout the year on the route Liverpool-Birmingham-Hamburg-Copenhagen.

FROM AIR SAFARIS, LTD., OF GATWICK AIRPORT, HORLEY, SURREY:—

APPLICATION NO. 4515 for a Normal Scheduled Service with Viking aircraft for the carriage of passengers, supplementary freight and mail on the route Jersey-Ostend-Rotterdam at an initial frequency of three return flights weekly increasing later to seven return flights weekly for seven years from 1961.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 557-9

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WOULD applicants for the vacancy for an air traffic control officer, announced on page 21 of the October 7 issue of THE AEROPLANE AND ASTRONAUTICS please note that applications can be received up to Monday, October 31, 1960. 557-6

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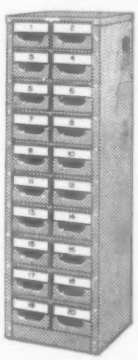

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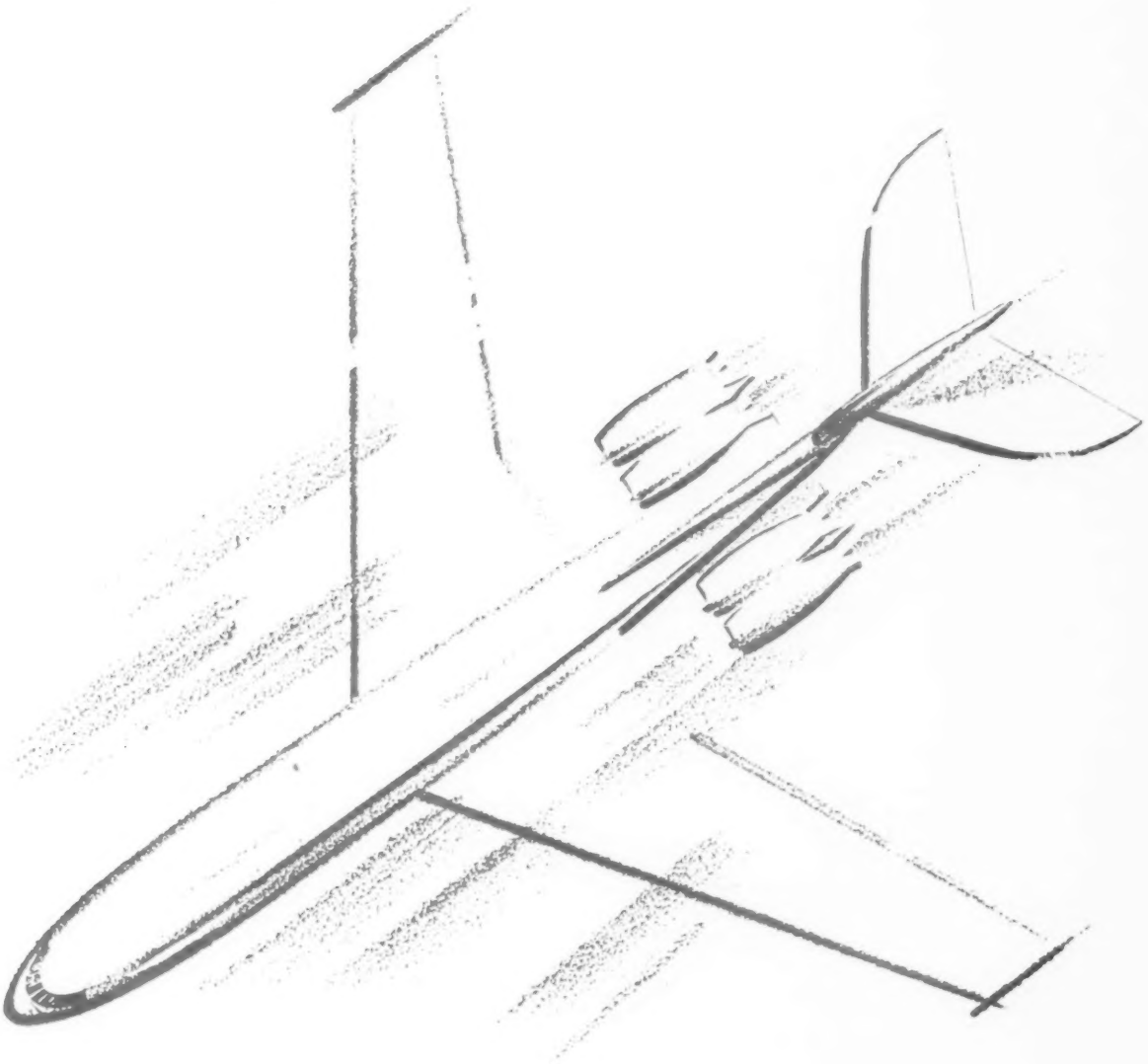

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